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METHODS AND MATERIALS FOR THE CONTROL OF INSECT PESTS.

By P. B. Richards.

PART V.

Chemical Measures II.—Contact Poisons.

It has been pointed out in an earlier paper of this series that stomach poisons distributed over foliage are effective as a remedy only against those insects which chew the plant tissues, and are not applicable to insects which suck the juices of their host-plant. It is not possible to poison the food of such insects from outside, so ingenious attempts have been made to administer poison through the conducting tissues of the plant itself. These attempts have so far met with little success, and the method cannot at present be considered of any practical value. It is, however, interesting, and may be worth a few moments consideration. Roughly speaking, there are two sets of vessels or tubes in a plant for the conveyance of food. One of these sets, situated in the wood (xylem) is concerned with the conveyance of raw materials from the root to the leaves. These raw materials consist of water and salts in solution extracted from the soil. In the leaves the raw materials are converted into forms suitable for assimilation and are then distributed throughout the plant by means of the other set of vessels (phloem) to be used in building up and maintaining the tissues of the plant. In trees the water-conducting vessels are situated in the outer layer of the wood, and those which convey the manufactured food in the innermost layer of the bark.

It is obvious that if some soluble stomach poison could be taken up by the roots of a plant, passed up to the leaves, and incorporated with the food manufactured in the leaves, without interfering with the normal activities of the plant, the problem of controlling plant feeding insects would be nearer solution. The power of selection exercised by the absorbing cells of the roots, and the complex nature of the metabolism of the plant have so far baffled experiment in this direction. Some measure of success has however been recorded recently from the United States of America.

By boring holes in the stems of attacked trees, and filling the holes with potassium cyanide, thus introducing a soluble poison directly to the conducting vessels of the wood, the selective action of the roots was eliminated. The poison was apparently taken up gradually by the water in the vessels, and conveyed to the leaves and young shoots, all the insects feeding on these being subsequently killed.

The experiment was conducted by Sanford (1) at the Stanford University, California. The following is a quotation from the author's account of his experiment:—

"I have in my grounds a plant of Spanish broom about a dozen years old and with a trunk about four inches in diameter which has for several years been seriously infested by cottony cushion scale (Icerya purchasi). I have tried various sprays, have put scale-eating beetles on the tree and at one time cut all the branches off and sprayed the trunk several times in the attempt to get permanently rid of this scale, but up to last winter it seemed that all attempts were in vain. In February of this year, when the broom was very thickly covered with the scale I bored a $\frac{3}{8}$ inch hole in the trunk to a depth of about three inches, filled the hole nearly full of crystals of potassic cyanide and plugged it up. In two days the scale began to fall from the tree and in a few days all appeared dead. Others hatched and attacked the tree, but lasted only a short time, and the tree has since been free from scale and very vigorous.

At the same time I bored a similar hole in an old peach tree which seemed to have passed its usefulness and put a like charge of potassic cyanide in it. The tree has since seemed more vigorous than before, and raised a fair crop of peaches. After feeding some of them to chickens and a rabbit with no apparent ill result, I ate some of the peaches, and could find nothing wrong with them. I have since put a similar charge of the cyanide in an orange tree with no apparent bad effect."

The poison used in the above experiment was a compound all the elements of which could be utilised in the normal metabolism of the plant. The fact that the fruit produced gave no harmful effects when eaten indicates that the poison was broken down into non-poisonous substances by the agency of the leaves before redistribution through the phloem vessels, but not until it had had sufficient time to take effect upon the insects.

This case, however, is one of fair success among many failures.

(1) Science. Philadelphia XL No: 1032. 9th October 1914. p. p. 519-520.

Very much more experiment needs to be done before the method can be said to be of wide utility, but should a suitable poison be discovered it will create a revolution in the sphere of insect-control.

Whereas the deadly effect of stomach poisons is limited at present to those insects which chew the plant tissues for their food, there is no such limit to the effect of contact poisons. As the name implies, contact poisons are insecticides which must be applied to the insect itself, and which act by contact with the outside of the insect. All insects can be killed by contact-poisons if sufficient be applied to them in suitable strength. The limiting factors in the case of contact poisons are the expense of very heavy applications, and the risk of injury to the plants from these poisons. In practise therefore, contact poisons are usually applied only to sucking insects; small biting insects, when present in large numbers, may however be economically treated with contact sprays.

The exact nature of the action of contact poisons upon insects is not definitely determined. Some are believed to act through the skin while others aim at causing asphyxiation by entering and choking up the breathing apparatus of the insect, or otherwise interfering with respiration.

Insects are, as a rule, air-breathers, but their respiratory system is vastly different from that of vertebrate animals. In the latter the blood is aerated in one part of the body, either lungs or gills, and is then circulated through blood vessels which penetrate all the tissues, thus supplying them with oxygen. In insects the blood is not contained in definite vessels, but occupies irregular continuous spaces throughout the body. The circulation is feeble and concerned more with the conveyance of food than of oxygen. Air is supplied directly to all parts of the body by means of an intricate system of tubes which open by pores (spiracles) in the sides of the body. There is not a single air-intake as in mammals, but as many as eleven pairs. Normally three pairs are situated on the thorax (that part of the body which bears the legs and wings), and the remaining pairs on the segments of the abdomen. The thoracic spiracles are usually reduced in the adult insect to a single pair in the prothorax (the segment carrying the first pair of legs).

The spiracles are no more constant in structure than in number. Some spiracles are not controlled by the insect while others are provided with a system of valves and muscles for the purpose of opening and closing. The spiracle usually consists of an oval horny ring closed by a valve. This leads into a chamber closed within by another valve, beyond which are the air tubes

(tracheæ). The tracheæ from all the spiracles are usually intimately connected, longitudinally by large tubes, from side to side and from the upper to the lower surface by others. By this arrangement, if one pore gets blocked the parts supplied from it can get air from the remaining spiracles. From these main trunks, branches are given off which ramify in all directions so that every organ can be liberally supplied with air. In a freshly killed insect these tubes are strikingly apparent on opening, being of a silvery brightness on account of the contained air.

Respiration takes place by alternate dilation and contraction of the abdominal segments, most of the air entering by the thoracic and first abdominal spiracles. Some slight interchange of gases may also take place by diffusion, while the chamber and valves mentioned above may serve as a pump to force air into the tracheæ. The valves also may serve to prevent dust or liquid or other foreign matter from entering the breathing tubes. In addition, the spiracles often carry a more or less complicated armature bearing bristles or hairs or waxy secretions which effectually bar the way to foreign bodies.

The integument or 'skin' of an insect consists of a layer of cells which excrete matter which remains attached to the body, forming the hard protective covering. This hard layer consists of chitin. It is not living tissue but, as it were, a perfectly fitting armour composed of waste products in the economy of the insect. This chitinous armour varies considerably in thickness and hardness in various insects. Generally speaking, it is thicker in insects which have a covering of hairs or scales or which excrete wax. The chitin, also, is not of uniform thickness all over the skin. It is formed in definite, closely-fitting, thickened areas between which, to allow of movement of the body, the skin is flexible, having very little chitin upon it. It will readily be seen that the thickness and resistance of the chitin is an important factor in the treatment of insects with contact poisons.

The problem, then, which confronts the entomologist wishing to kill insects by contact poison, is to find substances harmless to the host which, when applied to the insects, will penetrate the protecting devices, entering or choking up the breathing pores, or which will kill the insects by acting through the skin.

Sucking insects are of immense economic importance, especially in fruit growing countries, so that the matter is receiving the attention of entomologists all over the world with the result that there is now a considerable and increasing range of contact sprays, proprietary and otherwise, good, bad and indifferent, from which

to choose. Some are specially adapted to delicate foliage, others can only be used when the trees are bare of leaves on account of the injury they cause to the tender parts of the plant. Some are capable of killing very resistant insects while others are of little use against any but the least protected. Certainly no one spray has yet been evolved which will meet all cases. The selection of the contact poison to be used in any given case depends, therefore, not merely upon the type of injury done and the toughness of the foliage as in the case of stomach poisons, but in addition upon climate and the consequent habit of the attacked trees, the resistance of the chitinous armour and the presence or absence of hairy or waxy protections upon the insect, and the susceptibility of the insect to wetting.

Thorough wetting of the insect is, indeed, probably the most important factor in the efficiency of contact poisons. Given two sprays of the same type which are potentially of equal deadliness to the insect, but having different wetting power, the one which wets more thoroughly will in general be the more effective. If it be a poison acting through the skin it will act over a greater area and the likelihood of its reaching the less protected portions of the integument will be greater, while, if it be an asphyxiating spray the chances of entering, or of forming a film across all the minute breathing pores increase with the wetting power. One fair measure of the wetting power is surface tension, which can be roughly compared at sight as between various liquids by the height to which they ascend a tube of fine bore, such as a broken thermometer tube open at both ends. The one which rises the shortest distance in the tube when one end is placed in a receptacle containing the fluid is the one with least surface tension and is the most likely to give efficient wetting.

In order to wet insects which have a protection of waxy excretions, the spray fluid must be capable of dissolving the wax, thus allowing the poison to reach the spiracles or the skin. For this purpose one requires a spray fluid of a soapy nature.

It will not be possible or profitable to give recipes for all the various contact poisons now employed. Those which are suitable only for trees devoid of leaf would be of no value to the agriculturist in Malaya. Others have been devised to meet special conditions which do not arise here. A very few are sufficient to meet all the probable local demands, and to meet them effectively if the above facts are taken into consideration.

To summarise, contact poisons are used upon sucking insects, unless they are very big and scattered, and upon small biting in-

sects when they are sufficiently dense. The type of poison selected depends upon the skin of the insects; if thick and resistant, an asphyxiating spray is applied; if not strongly chitinised, either an asphyxiating or a skin-irritant poison may be used; while, if there is waxy secretion the poison must either be or contain a soap. Finally, as between two spray fluids otherwise of equal merit, that with the lower surface tension is the beter.

(Recipes for the preparation of contact poisons will be given next month.)

REPORT ON LOCUST WORK.

JANUARY, FEBRUARY AND MARCH, 1915.

By F. de la Mare Norris.

SELANGOR.

The locust situation in Selangor for this period of 1915 undoubtedly compares most favourably with that which existed in the corresponding season of 1914. Whereas in the latter the locusts were still firmly established in several localities and it was by no means certain that the existing staff was in a position to cope with the threatened spread of locusts, a consideration of the present situation leads one to the conclusion that, at the present time, the State is not itself a centre of infection, but is in a position somewhat similar to that of Perak at the commencement of the campaign with the exception that swarms are actually present, that is, none of the swarms have arisen from eggs laid in the State, but the few there are, have entered from the Negri Sembilan. Their appearance in Selangor in limited numbers cannot be regarded altogether as a misfortune, as it is easier to deal with them in this State than in the more difficult district of Northern Negri Sembilan. It has, however, been found advisable to put this latter district under the supervision of the Selangor officer. In this way he will be well aware of any large movement of locusts in a northerly direction and thus there will be little chance of the situation in Selangor ever becoming serious.

At the beginning of the year five swarms only were present in the State, of these three subsequently returned to Negri Sembilan and the remaining ones combined to form one large swarm which towards the end of January laid eggs in the vicinity of the 6th

mile, Kuala Lumpur—Sungei Besi Road. At the end of the month another swarm appeared in the Kajang district, but it was almost completely exterminated by fire. Early in February destruction work of the hoppers that emerged from the eggs deposited at the 6th mile Sungei Besi Road commenced. Warnings were given to all cattle owners to control their cattle, but they were so wilfully neglected and the owners appeared so incapable of grasping their meaning that it was afterwards considered too unsafe to employ the method. Consequently resort was made to the bag-trap system and this was employed throughout. Work continued during February and the first three weeks of March when it was brought to a successful termination. Early in March two more flying swarms appeared and by the end of the month the situation had been only slightly modified. Four flying swarms were present in the State, in the districts around Sungei Besi, Petaling and Serdang.

NEGRI SEMBILAN.

In the Tampin district flying swarms only were present to the end of February. Their number varied as they were continually crossing into and recrossing from the neighbouring States; there appeared to be a tendency, however, for swarms to enter the State and to move in a northerly direction. At the end of February eggs were laid at Gemenche and Jeu; during March more were deposited in these places and also at Ayer Kuning, Rembau and Kendong: destruction work continued throughout March. In the Coast district destruction work was in progress throughout the three months. In the earlier portion this was confined to the southern parts, but in the latter fresh hoppers appeared further north at Rantau, Siliau and St. Leonards. During the month of March small scattered swarms appeared north of Seremban in the Labu district, these also received attention and, considering the difficulty of their situation, some good results were obtained.

JOHORE.

At the commencement of the year about fifty swarms were located in the northern portion of the State. By the end of February however all but seven had moved out of the State in a northerly direction. In March some of these returned and eggs were laid and hoppers appeared in most of the districts infested by fliers. The hoppers were far less numerous than they were last year and it is hoped that, with the exception of a few swarms in remote districts, their destruction will be complete.

TABLE OF RESULTS.

JANUARY 1ST—MARCH 31ST, 1915.

	BAG-TRAP		POISON	TOTAL SWARMS
	Swarms	Tins	Swarms	
Selangor	197	4,633	—	197
Negri Sembilan	135	555	449	584
Johore	19	32	—	19
	351	5,220	449	800

A SUMMARY OF LOCUST WORK IN 1914.

BY F. W. SOUTH.

For the first six months of the year the staff engaged on the work of locust destruction remained the same as it had been at the close of 1913. In June an additional Special Assistant was appointed, but in September, following the outbreak of war, there was a reduction of staff to three Special Assistants in place of the former six and to eleven conductors. From the beginning of September to the end of the year the staff remained the same.

Fortunately the reduction in staff had very little influence on the success of the work, partly because the work previously done was beginning to have effect, but more especially because it occurred at a time when the use of a poisonous solution of arsenite of soda sprayed on the food plants was beginning to take the place of the driving method for the destruction of the locusts in the field. At the end of August this method had been in use on a large scale sufficiently long to have been well tested and had been found to be more effective, far more rapid and consequently cheaper than the driving method, since the same number of coolies could destroy about twice as many swarms in a day by the use of the poison as they could by the driving method. So successful has the poisoning method proved that as a result of the work in the last four months of the year with a reduced staff, using this method as much as possible, about 4,100 swarms were destroyed, as compared with about 3,500 swarms destroyed by the larger staff in the first eight months, when most of the work was done by the driving method. The driving method is now only used where poisoning is dangerous to animals or human beings.

Another interesting development that occurred during the year was the arrangement made between the F. M. S. and Johore Governments whereby the locust work in Johore was placed under

the control of the Department of Agriculture of the F. M. S. This occurred in October and previous to that date the locusts had only been present in Johore for a short time so that nothing had been done. As soon as they became fairly prominent in Johore by invasion from outside, steps were immediately taken to meet the situation. Some account of the work in this State will be given below.

There was one other development worthy of record. As will be seen from the table of results given below, locusts invaded the Temerloh district of Pahang. Two flying swarms moved up the Triang valley in August as far as Temerloh and Semantan. As soon as the hoppers arising from the swarms appeared, action was taken to destroy them with such success that the whole generation was killed and the district was again free from locusts at the end of October. Previously, another flying swarm had invaded a different district in Pahang, for in January one swarm made its way over the jungle to Bentong, but it apparently died out without laying any eggs, as no hoppers ever appeared there.

TABLE OF RESULTS OF LOCUST WORK IN F. M. S.

District.	Date.	Swarms driven.	Tins.	Swarms poisoned	Total swarms
SELANGOR.					
U. Selangor	Feb. 13th—March 13th	22	2,150	—	22
K. Lumpur	Feb. 23th—March 31st	101	2,871	—	101
	May 4th—June 30th	762	28,904	26	788
	Oct. 15th—Dec. 13th	149	3,927	1,124	1,273
Ulu Langat	March 12th—31st	320Es.	6,404	—	320
	Sep. 1st—Oct. 15th	111	2,207	503	614
Selangor Total	.. ..	1,465	46,463	1,653	3,118
NEGRI SEMBILAN.					
Seremban	March 21st—June 27th	549	3,244	139	688
S'ban & Jelebu	Aug. 22nd—Sep. 5th	42	203	44	86
Seremban	Oct. 24th—Dec. 15th	26	73	136	162
Coast	Jan 5th—July 5th	612	3,405	62	674
	Dec. 18th—31st	—	—	92	92
Tampin	Jan. 19th—28th	25	118	—	25
	March 28th—June 6th	445	7,520	—	445
	July 8th—Sep. 9th	442	4,301	9	451
	Nov. 4th—Dec. 31st	270	1,564	560	830
Kuala Pilah	Sep. 1st—Nov. 5th	342	1,606	447	789

N. Sembilan Total		2,753	22,034	1,489	4,242
PAHANG.					
Temerloh	Sep. 18th—26th	—	—	250	250
Pahang Total		—	—	250	250
GRAND TOTAL		4,218	68,487	3,392	7,610

It will be seen from the above table that, in round numbers, 68,500 kerosene tins full of hoppers were destroyed during the year (1 kerosene tin = 4 gallons). These represented approximately 4,200 swarms. In addition approximately 3,500 swarms were poisoned and a further 250 swarms were destroyed at Temerloh, so that in all about 7,600 swarms were destroyed.

The cost of the work for the year was $81,139.26, as against an estimated expenditure of $105,000. The expenditure included the cost of the necessary sprayers and of the repairs and replacements of all the apparatus. It was found that the sheeting became worn very rapidly when subjected to continuous use and consequently a certain amount of it had to be replaced at intervals. The chief cause of its destruction was that the hoppers when large would eat it, even when precautions had been taken to prevent this by treating the sheets with crude kerosene the effect of which was not always sufficiently permanent.

From April to October there was a tendency to a general movement of the locusts in the Malay Peninsula in a north-westerly direction; while during the remainder of the year the direction was reversed. In spite of this there were no locusts of any importance in the northern portion of Selangor after March 13th when the work of destroying a generation of hoppers found there was completed. The offspring of the swarms that escaped in or moved into the State during the year were almost entirely destroyed and at the close of the year only 5 or 6 swarms were to be found in Selangor. These were in the country between Kuala Lumpur and the southern boundary. At the end of the year in the Negri Sembilan there were only one or two flying swarms in the Tampin district; hoppers occurred in the southern end of the Coast district where work was commenced on December 15th and was still in progress at the close of the year; the other parts of this State were free from locusts.

Locust Work in Johore.

After the appointment of an Assistant Agricultural Inspector early in October two Malay mandors experienced in locust work were loaned to the State from Selangor. A local staff of mandors was also appointed and work was commenced on the location of flying swarms and the general distribution of locusts in the State. Hoppers appeared in November and destruction work was commenced towards the end of the month. The local men were trained in the work by the two experienced mandors from Selangor under the supervision of the Assistant Agricultural Inspector. The destruction work was continued until the end of the year when all the hoppers not destroyed had changed into fliers. During the working period the necessary apparatus had been obtained and the staff had been trained. The results obtained are given in the table below and must be regarded as quite satisfactory considering the difficulties to be overcome both in the matter of training the staff and in questions of transport. All is now in readiness for steady and continuous work in the coming year.

Table of Results in Johore.

District.	Date.	Swarms. driven.	Tins.	Swarms. Poisoned.
Lanadron	Nov. 24—Dec. 21	64	174	84
Tangkah	Nov. 24—Dec. 31	115	204½	22
Genuang (Batu Anam)	Dec. 6—Dec. 19	—	—	23
Modo (Lanadron)	Dec. 23—28	—	—	12
Sungei Mati	Dec 21—29	—	—	10
		179	378½	151

Total swarms destroyed 330.

At the end of the year numerous flying swarms were reported in Johore as fresh swarms in some numbers were continually entering the State from outside. Consequently much work was expected in the early months of the coming year.

General Summary of the Position.

The results of the year's work may be considered as satisfactory, as in Selangor and the Negri Sembilan the locusts have certainly been much reduced in numbers and a beginning has been made with their destruction in Johore. It would appear that on the whole the number of locusts present in the entire Malay Peninsula has been considerably reduced.

During the coming year there should be no difficulty in restricting the swarms in Selangor to such as may enter the State from the south, or in destroying the offspring of these. In fact at the end of the year 1914 it could be considered that only one swarm of locusts was present in the State that had arisen from eggs laid in the State. The insects should be kept well under control in the Negri Sembilan and Johore and the total number of locusts in the Peninsula be very much smaller. The complete extermination of the insects is, however, a matter about which nothing can be said so long as the present conditions of work continue.

THE ENACTMENT TO AMEND "THE AGRICULTURAL PESTS ENACTMENT, 1913."

By F. W. South.

Practical experience of locust destruction during the end of the year 1913 and the earlier part of the year 1914 showed that the powers conferred on officers in charge of locust work by the "Agricultural Pests Enactment" were insufficient in two important respects. In the first place such officers even when duly authorised as Inspectors had no power of entry on land other than agricultural land. This was a serious drawback, as locusts occur commonly on mining land and even occasionally on building lots. In the second place the officers had no legal right to use poison to kill the locusts so that difficulties might have arisen in the event of cattle being accidentally killed by the poison even after careful precautions had been taken.

To repair these deficiencies Enactment No. 24 of 1914 was passed and published in the gazette of December 16, 1914. This Enactment may be read and construed as one with the original Agricultural Pests Enactment of 1913.

Section 2 of the new Enactment or 12 of the original Enactment provides the powers lacking as shown above. Subsection (i) *a*, permits any Inspecting Officer to enter on any land for the purpose of ascertaining if locust eggs or "hoppers" are present. Subsection (i) *b* authorises an Inspecting Officer to enter on any land where locust eggs or hoppers are present and to bring with him any necessary assistants and apparatus and also to take any action he may consider necessary to destroy the locusts, either by the use of poison or of mechanical apparatus or by any other means he may think fit. There is, however, the restriction that where the work is done by a subordinate officer to whom the necessary powers have been delegated in writing under Section 3 sub-

section (iii) of the original Enactment the action taken by the subordinate must be limited to such as is expressly authorised in writing by the delegating officer. In practice this means that any Asiatic subordinate officer when destroying locusts has to carry out written instructions given him by the responsible officer in charge of the work in the district and he may not go beyond those instructions; the use of poison is thus prevented unless the responsible officer decides that it can be employed with reasonable safety. In the case of European owned estates the Manager is always consulted on this point before any poison is put down on his estate.

Section 4 of the new Enactment amends section 20 of the original Enactment and causes it to read as follows:—

"Subject to the provisions of section 17, no owner or occupier of land or other person shall be entitled to compensation for any expense incurred or damage occasioned by any order given or act done in pursuance of the provisions of this Enactment or any rule thereunder unless such damage were occasioned by *Negligence* or maliciously and without reasonable cause, etc." In accordance with this section it is necessary for the officers engaged on locust work to give reasonable warning and take reasonable precautions to prevent accidents to cattle or other domestic animals when poison is being used. In the case of land used or likely to be used as a pasture for cattle a definite system of warning notices has been instituted and watchmen are posted on poisoned areas to prevent such accidents as are indicated above.

Section 3 of the new Enactment outlines the duties of owners or occupiers of land on which locust eggs or hoppers are found. It requires an owner or occupier to give notice in writing to an Inspecting Officer or at the nearest Land Office or Police Station of the appearance of the locusts. Planters are reminded that their help in this respect in the past has been very useful and that their continued help is much desired. This section further provides than an owner or occupier of land on which locust eggs or hoppers appear must use his utmost endeavours to destroy the locusts, carry into effect all instructions given to him by an Inspecting Officer for this purpose, render all assistance in his power towards the carrying out of any action taken or directed by an Inspecting Officer, and in particular place at the disposal of any Inspecting officer on demand so many of his labourers as the Inspecting officer may require; these labourers may be drawn from those working on the actual land on which the locusts appear or on any other land owned or occupied by the same owner or occupier if it is distant not more than three miles from the land on which

the locusts actually occur. The use of the labourers can only be required for one week and the number removed for locust work must not exceed half the total number employed by the owner or occupier. The next half of the section provides that the wages of labourers utilised in this way for the destruction of locusts are recoverable from public funds, the amount recoverable being fixed in respect of each labourer by rule under section 21 of the Agricultural Pests Enactment. Any other expenditure incurred by an owner or occupier in the destruction of locusts is recoverable from public funds if it is certified as reasonable by an Inspecting Officer and approved by the Resident of the State.

In practice the Officers engaged on locust work endeavour as far as possible to utilise their own labour force and obtain their own coolies from local Kampong Malays and similar sources, but where a Manager can easily spare coolies they are often glad to engage them for a short time at the estate rate of pay. It must, however, be remembered that although officers carrying out locust destruction work endeavour not to have to remove estate labour when it can ill be spared, yet they are within their rights if they do requisition it. The penalty for failing to provide labour when required or for any other breach of the provisions of section 3 of the new Enactment is a fine not exceeding two hundred and fifty dollars.

GREEN MANURING, AND COVER PLANTS.

By R. W. Munro, Morib, Selangor.

It is now a year or more since I expressed the hope that it would be possible to give within a reasonable time to our Department of Agriculture some results of trials made with leguminous plants on certain experimental plots under my own supervision.

From the legion of leguminous plants that are known to collect nitrogen, and thus to benefit and materially improve the condition of nearly every kind of soil that we have to deal with in this country I have chosen for special study some of those belonging to the sub-tribes Mimosae, and Papilionaceae, chiefly on account of the opportunities given to me for obtaining the seeds of these particular varieties.

Considering the length of time for which the properties of leguminous plants have been recognised in agriculture it is little short of astonishing that with the vast areas under cultivation in the F. M. S., and with anything but rich soil to help us there can

be so very few cases recorded of a planter employing any method of cultivation whereby the soil may be enriched beyond that of ordinary ploughing or harrowing.

We often do a great deal to impoverish the soil, and there is no doubt that the reason for this must be largely attributed to the fact of there being few who know or care to know anything about cultivation as long as they can show a well scraped-over, clean block of land. We are too often taught by people from other countries that this is the thing to do, and so to depart in any way from that most excellent principle of clean weeding would be anathema pure and simple to the man who regards nothing except what he saw and was told when working on a few acres of tea or coffee before coming to this country. In other countries, and under varying conditions there is no doubt that considerable risks might be run by preaching any kind of doctrine that was not entirely orthodox.

We must, however look at the whole question in a much broader light, and should, in view of past experience recognise the dangers likely to arise from being off our guard when a serious drought is with us.

We know in dealing with cover plants (leguminous) that the benefit to be derived from their use is not only to protect the soil during a long spell of dry weather, and by mulching with the green vegetable matter obtainable prevent the surface soil from becoming caked. However usefully these functions are performed there are other special benefits to be derived, such as the adding of humus to soils deficient in this respect, the prevention of wash on hilly lands, the collecting of nitrogen and fixing it permanently into soils that require it; another and a very useful function is the decrease in the usual monthly weeding, and incidentally economy in labour.

Non-leguminous plants should not be utilised with the idea of effecting any of the above results, although some of them have a distinct economic value.

Reverting to the various species of nitrogen collecting plants the following have been given a trial and can be strongly recommended as likely to yield good results:—

Clitoria Cajanifolia, Crotolaria Striata, Crotolaria Quinquifolia Canavalia Ensiformis, Centrosema Plumieri, Mimosa Pudica, Mucuna sp., Tephrosia Candida, Tephrosia Purpurea.*

In deciding upon a cover plant it is obvious that preference must be given to one that is likely to form as complete a cover as

possible in the shortest space of time, and from the above list the Canavalia, and Mucuna* are far and away ahead of any of the others in this respect.

* Mr. Munro's "Mucuna" is probably *Stizolobium aterrimum* according to an identification made recently at Kew.

The seeds of Canavalia can be sown closer to the rubber or coconuts, (or whatever the main crop happens to be) than those of the Mucuna because the plant has not the same tendency to climb. The seeds if placed in water the night before planting will germinate in 48 hours, and if planted three feet apart will develop into a complete cover in about six weeks as long as the soil on which they are growing has the necessary amount of humus to give them the start they require. Both of the above mentioned plants are what may be termed perennial twiners, and establish themselves very quickly.

My thanks are due to the Director of Agriculture, F. M. S., and to Dr. van Hall of Buitenzorg for having supplied me with the original seeds.

The Mucuna differs from the Canavalia in one respect viz: that it does not seed and die back nearly so quickly, but for general purposes I favour the latter plant because, if the fruit is prevented from maturing by picking off the flowers, the plant itself goes on flourishing, and in no case attains a height likely to become cumbersome or unwieldy. I have not had the opportunity of giving this plant a trial on hilly land but I would say that of all the species known to us it is likely to be one of the best for preventing the top soil wash. It will be remembered how that a few years back the passion creeper was more or less extensively employed on rubber estates with the object of keeping in check heavy grass, weeds, and lalang, and this plant has sometimes been aptly called the "Poor man's friend." It is unfortunate that the advantages of the Mucuna were so little known to us then. There is nothing that I have seen of the kind that can compare with the extraordinary rapid and vigorous growth of this bean: if encouraged in the right way it will completely smother the heaviest grass and lalang in about six months.

For the Canavalia the land must be previously quite clean, but for the Mucuna it need not necessarily be so.

If a sufficient stock of seed has been obtained it is recommended that after 8 or 9 months the plants be taken out and either dug into the soil or placed as a mulch round the roots of the main crop that is being cultivated. It appears to be the generally ac-

cepted idea that the full amount of nitrogen is available if the plants be dug into the soil previous to infloresence.

As remarked at the outset these are only a few notes on some of the many valuable species of leguminous plants, but I would like to make mention of both the Tephrosias which have done very well on our soil; also the *Dolichos Hosei* (Sarawak Bean) which is a creeping plant of extreme value.

It will be remembered by some of our readers that the *Crotolaria Striata* was introduced into this country from Ceylon about ten years ago, but efforts to make it of economic value were crowned with little success on account of those in charge of dealing with and establishing it being untaught in the necessary methods.

In this, like every other kind of cultivation, there is a certain amount of special knowledge required, and very little was known to us of this kind of cultivation in those days.

I propose dealing further with the subject in a later issue of the *Agricultural Bulletin* when results of trials with other plants enable me to state definitely the varieties recommended for both hilly and flat lands: clay soils and sandy ones.

"Hygienic Management of Labour in the Tropics," by the late Dr. P. N. Gerrard, Captain, M. S. V. R. Price $2.00. Postpaid $2.10.

This book has been written for the guidance of employers of labour on estates in Malaya, and is especially intended for those employers who have no Medical Officer resident on the estate to whom they can turn for advice on medical or sanitary matters.

The first portion of the book is devoted to sanitation or the prevention of disease, the second deals with the symptoms, diagnosis and treatment of such diseases as are most likely to be met with; the third portion contains the Labour Code of the F. M. S. and the rules connected with it.

Model plans for coolie lines, wells, and estate hospital wards are contained in the appendix.

The book contains much useful information which is presented in a way that will interest the general reader without confusing him.

Dr. Gerrard has succeeded in the task he set himself, viz.: "The exposure to the Planters of some of the commonest pitfalls on the road of Hygienic Estate Management and the measures by which they can be avoided."

The book, which should interest the late Dr. Gerrard's many friends among planters, can be obtained from the Methodist Publishing House, Singapore.

Comparative Returns of Imports, F. M., S. during the years 1914 and 1913.

Articles	How counted.	Selangor.		Perak.		Negri Sembilan.		Pahang.		1914 Total.		1913 Total.	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
			$		$		$		$		$		$
Coconuts	Pikuls	...	572	...	20,029	...	494	...	40	...	21,135	...	8,935
Copra	,,	5	48	392	3,467	...	...	...	...	397	3,515	2	25
Coffee	,,	68	2,214	544½	15,118	134	4,076	208	6,622	954½	28,030	1,473 3/16	46,544
Padi	,,	21,347½	64,067	74,307	166,452	1,955	6,266	3,422	9,743	101,031½	246,528	118,033	328,196
Rice	,,	1,412,451	7,155,210	1,512,359	7,097,492	332,441	1,778,482	123,536	658,590	3,380,787	16,689,774	3,379,353	18,982,984
Pepper	,,	501¾	12,056	267 ¼	6,935	118½	3,285	2	47	889½	22,323	1,011 1/20	25,448
Sugar	,,	73,886¼	469,328	127,780	793,964	17,795	111,053	7,864	55,559	227,325¼	1,429,904	262,407½	1,621,028
Tapioca	,,	2,895½	12,653	4,467	55,740	882	3,960	5½	37	8,250	72,390	10,489	80,669
Gambier	,,	250¼	2,402	349½	5,839	140½	1,363	83	1,188	823¼	10,792	665	8,667

Comparative Returns of Exports, F. M. S., during the years 1914 and 1913.

Articles.	How counted.	Selangor.		Perak.		Negri Sembilan.		Pahang.		1914 Total.		1913 Total	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
			$		$		$		$		$		$
Coconuts	Pikuls	...	36	...	593	...	1,616	...	150	...	2,395	...	1,991
Copra	,,	54,760¼	561,485	182,646	1,852,175	2,542	24,348	3,640½	35,240	243,588¾	2,473,248	156,033 7/10	1,808,933
Coffee	,,	8,899¾	311,666	395⅜	8,858	...	...	24	357	9,319 7/20	320,881	13,898¾	438,929
Padi	,,	24	52	112,134	238,826	16	54	...	...	112,174	238,932	181,624	538,500
Rice	,,	...	...	174,850	783,675	...	...	...	...	174,850	783,675	208,998	1,012,083
Pepper	,,	16	248	...	...	209½	4,104	103	1,798	328½	6,060	1,246⅜	24,844
Sugar	,,	...	3	121	901	...	...	...	...	121	904	2,229 8/10	6,375
Tapioca	,,	4	11	14,272	17,101	21,585	117,802	8,886	54,596	44,747	189,510	49,291	199,440
Gambier	,,	2,216½	16,209	...	...	7,222	59,459	...	...	9,438½	75,668	1,244,635	181,174

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1915 and 1914.

Destination.	Exported during Januray, 1915.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1915.	Duty collected, 1915, to date.
	Tons.	Tons.	Tons.	Tons.	Tons	Tons.	$	$ c.
Straits Settlements ...	1,953.37	...	1,953.37	1,289.78	663.59	...	3,673,683	
United Kingdom ...	1,384.95	...	1,384.95	1,071.60	313.35	...	2,604,639	
Continent of Europe ...	1.00	...	1.00	119.46	...	118.46	1,881	
Ceylon	80.81	...	80.81	61.61	19.20	...	151,988	
Other Countries ...	53.09	...	53.09	...	53.09	...	99,847	
Total ...	3,473.22	...	3,473.22	2,542.45	1,049.23	118.46	6,532,038	169,355 45

KUALA LUMPUR,
6th February, 1915.

F. J. WELD,
Acting Commissioner, Trade and Customs, F.M.S.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, During the Years 1915 and 1914.

Destination.	Exported during February, 1915.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1915.	Duty collected, 1915, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	2,201.69	1,953.37	4,155.06	2,561.33	1,593.73	...	7,955,149	
United Kingdom ...	1,101.57	1,384.95	2,486.52	1,979.17	507.35	...	4,746,146	
Continent of Europe...	...	1.00	1 00	241.06	...	240.06	1,881	
Ceylon	65.42	80.81	146.23	124.55	21.68	...	277,982	
Other Countries ...	41.98	53.09	95.07	...	95.07	...	181,447	
Total ...	3,410.66	3,473.22	6,883.88	4,906.11	2,217.83	240.06	13,162,605	339,767 05

KUALA LUMPUR,
8th March, 1915.

F. J. WELD,
Acting Commissioner, Trade and Customs, F.M.S.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, During the Years 1915 and 1914.

Destination.	Exported during March, 1915.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1915.	Duty collected, 1915, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	2,464.32	4,155.06	6,619.38	3,858.00	2,761.38	...	12,923,195	
United Kingdom ...	920.74	2,486.52	3,407.26	2,860 33	546.93	...	6,602,372	
Continent of Europe ..	...	1.00	1.00	357.10	...	356.10	1,881	
Ceylon	33.32	146.23	179.55	198.84	...	19.29	345,168	
Other Countries ...	...	95.07	95.07	49.53	45.54	...	181,447	
Total ...	3,418.38	6,883.88	10,302.26	7,323.80	3,353.85	375.39	20,054,063	518,704 96

KUALA LUMPUR,
8th April, 1915.

F. J. WELD,
Acting Commissioner, Trade and Customs, F.M.S.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value, and Duty Collected Thereon, During the Years 1915 and 1914.

Destination.	Exported during April, 1915.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1915.	Duty collected, 1915, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,939.03	6,619.38	8,558.41	4,989.76	3,568.65	...	16,832,109	
United Kingdom ...	794.56	3,407.26	4,201.82	3,678.02	523.80	...	8,204,370	
Continent of Europe ...	4.00	1.00	5.00	443.02	...	438.02	9,945	
Ceylon	39.62	179.55	219.17	264.18	...	45.01	425,040	
Other Countries ...	...	95.07	95 07	100.27	...	5.20	181,447	
Total ...	2,777.21	10,302.26	13,079.47	9,475.25	4,092.45	488.23	25,652,911	663,604 44

KUALA LUMPUR,
6th May, 1915.

F. J. WELD,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of January, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	...	81.35	92	68	24	76.60	844	...	80	...	14.60	3.06
Kuala Kangsar ...	...	...	80.07	92	68	24	75.05	802	...	78	...	7.30	3.12
Batu Gajah ...	...	99	80.22	92	70	22	75.75	833	...	82	...	5.37	1.40
Gopeng	...	...	80.25	91	67	24	74.72	788	...	76	...	9.21	6.28
Ipoh		...	81.67	93	68	25	75.77	812	...	76	...	4.16	1.29
Kampar			79.86	91	69	22	75.92	845	...	84	...	5.99	1.32
Teluk Anson			82.23	93	70	23	77.08	861	...	79	...	5.81	1.30
Tapah			77.65	92	66	26	73.28	762	...	82	..	9.62	1.45
Parit Buntar			82.06	92	68	24	77.16	867	...	81	...	5.15	1.32
Bagan Serai			81.37	90	70	20	77.17	876	...	83	...	4.80	.94
Selama			80.33	91	66	25	76.67	869	...	85	...	9.63	2.65
Lenggong			79.78	91	66	25	77.00	807	...	80	...	1.30	.49
Tanjong Malim ...			80.42	94	68	26	77.70	914	...	89	..	4.44	1.54
Grit			78.81	93	64	29	77.09	778	...	80	...	1.55	.62
Klian Intan			77.03	90	65	25	77.96	759	...	82	...	4.45	1.70
Pulau Pangkor Laut. ...			...	...	...	...	...	...	...	...	...	4.92	1.00
Kuala Kurau			...	...	...	...	...	...	...	...	...	6.27	1.35
The Cottage			...	...	...	...	..	...		...	...	9.16	2.71
Maxwell Hill ..			...	...	...	...	...	...	...	...	...	9.17	2.10

Office of the Senior Medical Officer,
Taiping 13th February, 1915.

S. C. G. FOX.
Senior Medical Officer Perak.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping, ...	...	...	83.43	93	70	23	77.47	.862	...	77	...	7.18	3.93
Kuala Kangsar ..	...	...	83.44	95	68	27	76 19	.805	...	71	...	1.19	1.11
Batu Gajah ...	...	100	82.07	94	69	25	76.45	.836	..	77	..	3 33	1.13
Gopeng ...	...	...	82.83	93	69	24	74.92	.763	...	69	...	3.90	2.50
Ipoh ...	...	...	84.70	96	69	27	76 33	.797	...	68	...	4.44	3.30
Kampar ...	...	...	82.37	94	70	24	76 67	.841	..	77	...	5.92	2.40
Teluk Anson ...	...	..	83.03	93	68	25	77 17	.855	...	77	...	1.60	1.60
Tapah ...	...	...	81.80	94	67	27	76.00	.822	...	77	..	3.77	.82
Parit Buntar ...	...	...	83.78	94	69	25	77 62	.865	..	75	...	3.66	1.60
Bagan Serai ...	...	...	83.10	92	72	20	77.85	.884	..	79	...	2.11	.69
Selama ...	...	...	82.70	95	68	27	77 91	.893	...	81	...	4.52	3.50
Lenggong ...	...	...	82.92	96	65	31	75.34	.777	...	69	...	1.00	.57
Tanjong Malim ...	...	...	82.52	94	65	29	79.03	.948	...	87	...	3.50	1.05
Grit ...	..	...	80.43	97	62	35	72.55	.697	...	68	...	.98	.98
Klian Intan ...	...	..	79.85	95	63	32	72 27	.690	...	68	...	...	...
Kroh ...	...	...	78.78	101	75	26	73.47	.755	...	78	...	...	...
Pulau Pangkor Laut ..	...	...	...	...	...	...	...	...	..	...	...	1.24	.50
Kuala Kurau ...	...	...	...	...	...	...	..	...	...	...	...	1.89	1.55
The Cottage .	...	...	...	...	...	...	...	...	...	...	...	3.92	3.67
Maxwell Hill ...	...	...	...	...	...	...	...	...	...	...	...	4.18	3.53

Office of the Senior Medical Officer,
Taiping, 15th March, 1915.

S. C. G. FOX,
Senior Medical Officer, Perak.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of March, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Maximum.	Minimum.	Range.	Hygrometer. Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Wind.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping ...	...	...	83 38	95	71	24	78.27	.898	...	79	...	23.14	3.69
Kuala Kangsar ...	...	...	82 58	97	70	27	76 84	.830	...	78	...	9 18	3 99
Batu Gajah ...	...	97	81.82	97	70	27	76.79	.831	..	77	...	11.22	2.70
Gopeng ...	...	...	82.39	94	74	20	76 08	.821	..	75	...	12.46	3 28
Ipoh ..	...	..	84.09	96	70	26	77.26	.846	...	75	...	6.09	2 00
Kampar ...	...	...	81.39	94	70	24	76.88	.846	...	82	...	13.85	2.65
Telok Anson ..	...	...	83.10	95	70	25	77.61	.864	...	79	...	13 86	2.60
Tapah ...	...	...	81.24	95	69	26	76.40	.843	...	82	...	25.26	4.20
Parit Buntar ...	...	...	23.64	95	71	24	78.37	.893	...	79	...	9.56	1.69
Bagan Serai ...	...	...	82.66	95	72	23	78 08	.907	...	83	..	8.21	2.72
Selama ...	...	...	82 06	95	70	25	78 44	.920	...	87	...	21 68	4 68
Lenggong ...	...	...	82.92	97	67	30	76.70	.822	...	75	...	4.52	1.50
Tanjong Malim ...	.	...	81 41	96	66	30	76.78	.845	...	82	...	10.76	1.74
Grit ...	...	...	82 52	98	62	36	75.83	.789	...	74	...	3.80	1.38
Klian Intan ...	...	...	80.65	98	65	33	74.65	.766	...	74	...	6.24	2.50
Kroh ...	...	...	87.97	99	80	19	74 33	.801	...	86	...	5.06	1 20
Pulau Pangkor Laut ...	...	...	...	...	...	...	...	...	...	...	...	5.82	1.12
Kuala Kurau ...	...	...	...	...	...	...	...	..	...	...	...	7.29	3.11
The Cottage ...	...	...	...	...	...	...	...	...	...	..	..	17.35	3.25
Maxwell Hill ...	...	...	...	...	...	...	...	...	..	...	...	12.55	2.85

Office of the Senior Medical Officer,
22nd April, 1915.

S. C. G. FOX,
Senior Medical Officer, Perak.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	..	..	82.67	94	70	24	78.47	916	..	83	..	19.29	2.68
Kuala Kangsar	..	..	81.10	94	73	21	77.00	918	..	95	..	9.24	1.56
Batu Gajah	..	96	81.44	94	73	21	76.92	870	..	82	..	11.20	2.00
Gopeng	..	..	80.35	94	69	25	76.22	850	..	82	..	12.57	4.37
Ipoh	..	..	82.96	94	71	23	77.71	881	..	79	..	6.04	1.00
Kampar	..	..	80.21	93	71	22	77.23	895	..	87	..	24.94	2.80
Teluk Anson	..	..	82.39	93	71	22	77.60	886	..	83	..	9.99	1.40
Tapah	..	..	80.47	94	68	26	76.08	848	..	82	..	15.43	2.45
Parit Buntar	..	..	85.53	94	71	23	81.09	1001	..	83	..	12.22	2.80
Bagan Serai	..	..	82.69	91	73	18	78.59	920	..	83	..	11.57	2.56
Selama	..	..	81.23	93	72	21	77.33	889	..	87	..	16.39	2.63
Lenggong	..	..	81.44	94	70	24	76.44	843	..	78	..	11.78	2.67
Tanjong Malim	..	..	82.09	94	70	24	78.62	931	..	87	..	11.57	1.90
Grit	..	..	81.62	96	70	26	76.66	854	..	82	..	7.90	1.51
Klian Intan	..	..	79.00	92	70	22	75.23	828	..	86	..	9.44	1.45
Kroh	..	..	79.46	90	80	10	76.27	877	..	91	..	12.51	3.35
Pulau Pangkor Laut ..	..	..	..	..	..	..	..	..	..	..	..	7.68	2.16
Kuala Kurau	..	..	..	..	..	..	..	..	..	..	..	8.90	3.09
The Cottage	..	..	..	..	..	..	..	..	..	..	..	23.59	4.26
Maxwell Hill	..	..	..	..	..	..	..	..	..	..	..	22.12	4.10

Office of the Senior Medical Officer,
14th May, 1915.

S. C. G. FOX,
Senior Medical Officer, Perak.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of January, 1915.

DISTRICT	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE				HYGROMETER				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
District Hos., Seremban	...	150 4	78.7	87.0	71.0	16 0	78.7	.823	73.1	83	N	4.46	1.09
,, ,, Mantin	...	...	...	...	...	...	...	...	...	...	...	4.75	1.38
,, ,, Jelebu	...	...	78.9	84.9	73.2	11.7	75.8	...	...	...	...	1.24	0 35
,, ,, Tampin	...	...	79.5	89.5	75.0	16.5	75 5	.810	72.9	81	...	4.04	1.52
,, ,, Port Dickson	...	...	80.9	86.8	73.3	13.5	76.7	...	...	...	...	4 89	0.81
,, ,, Kuala Pilah	...	153.6	79.5	86.3	71.5	14.8	77.2	.890	75.1	89	...	2.86	0.70

Offic of the Senior Medical Officer,
K. Lumpur, 19th February 1915.

SD. A. J. MCCLOSKY,
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction fo Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital Seremban	...	155.7	80.1	89.6	71.3	18.3	76 6	.851	74.0	81	N. W.	3.46	1.59
,, Kuala Pilah	...	157.6	81.4	89.0	72.3	16.7	78.7	.927	76.9	83	...	1.79	0.80
,, Tampin ...	...	150.8	82.8	91.7	73.6	18.1	77.2	.829	73.5	74	...	0.97	0.52
,, Jelebu ...	...	...	79.4	86.1	73.0	13.1	75.6	...	...	...	...	1 90	1.19
,, P. Dickson	...	146.1	82.7	88.2	74.1	14.1	77.3	.836	73.8	74	...	2.72	1 17
,, Mantin ...	...	...	...	...	...	...	...	...	...	...	...	3.30	0.63

Office of the Senior Medical Officer,
K. Lumpur, 19th February, 1915.
K. Lumpur, 1914.

SD. A. J. MCCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of March, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah	Maximum in Sun.	TEMPERATURE				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban ..	..	158.0	80.4	90.8	72.2	18.6	75.7	.806	72.6	78	N.	9.29	2.76
„ Kuala Pilah ..	..	159.0	81.9	90.6	72.6	18.0	79.2	.939	77.4	86	..	7.75	2.10
„ Tampin ..	..	152.5	83.6	93.5	74.7	18.8	78.0	.849	74.2	74	..	9.88	2.64
„ Port Dickson	..	136.7	83.6	89.3	74.7	14.6	78.2	.859	74.6	74	..	3.91	1.24
„ Jelebu ..	..	..	80.6	87.1	74.4	12.7	75.5	..	..	..	..	5.98	1.91
„ Mantin ..	..	..	..	..	..	..	..	..	..	..	..	11.86	2.81

Office of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang,
K. Lumpur, 1914.

A. J. McCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban ..	..	157.6	80.6	89.6	72.7	16.8	77.4	.874	75.1	83.2	N.W.	11.47	1.92
„ Mantin ..	..	..	..	..	..	..	..	..	..	..	..	10.55	1.85
„ Jelebu ..	..	..	81.4	..	..	..	76.8	..	..	..	..	5.04	2.10
„ Tampin ..	..	150.0	81.8	91.6	74.1	17.5	77.4	.855	74.4	79.1	..	11.59	1.74
„ Port Dickson	..	134.0	82.6	88.6	74.8	13.7	78.4	.888	75.6	80.0	..	15.59	4.35
„ Kuala Pilah ..	..	158.4	80.8	91.0	73.1	18.5	78.5	.943	77.4	89.7	..	6.00	1.09

W. P. MELDRUM,
Medical Officer in Charge, Negri Sembilan.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of January, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hos., Kuala Lipis	...	...	79.6	86.7	70.4	16.3	75.2	...	..	...	...	6.94	1.78
,, ,, Raub	...	...	78.8	88.6	69.4	19.2	74 0	...	..	...	...	3.45	1 80
,, ,, Bentong	...	..	79.2	87 6	71.5	16.1	74.7	...	..	...	...	5.99	2.90
,, ,, Pekan	...	...	78.7	82.3	71.0	11.5	75.8	...	...	...	...	21.36	4.03
,, ,, Kuantan	...	...	77.2	88.2	73.4	14.8	73.3	...	...	...	...	11.17	1.00
Dispensary Temerloh	...	...	...	89.0	66.7	19 5	...	...	...	...	...	5.71	1.73
,, ,, Sungei Lembing	...	...	...	85.6	69.2	16.4	...	...	...	...	...	16.91	4 60
,, ,, K. Tembeling	...	...	...	...	...	...	...	...	...	...	...	7.19	2.50
	...	...	...	...	...	...	...	...	...	...	...	...	...

Office of the Senior Medical Officer.
K. Lumpur, 19th February, 1915.

SD. A, J. MCCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipis	..	..	81.6	89.8	70.2	19.6	75.2	..	..	..	..	1.68	1.03
„ Raub ..	..	..	80.4	90.1	68.1	22.0	73.7	..	..	..	..	1.10	0.50
„ Bentong ..	..	..	81.0	88.9	69.7	19.2	75.0	..	..	..	..	2.90	0.75
„ Pekan ..	..	..	80.5	85.6	70.0	15.6	75.6	..	..	..	..	4.43	1.83
„ Kuantan ..	..	..	79.6	88.3	72.8	15.5	74.5	..	..	..	..	2.76	1.90
Dispensary Temerloh ..	..	..	..	92.8	70.8	22.0	..	..	..	..	..	2.19	0.96
Sungei Lembing	..	..	..	89.8	68.2	21.6	..	..	..	..	..	4.00	1.60
Kuala Tembeling	..	..	..	..	..	..	..	..	..	..	..	1.50	0.89

Office of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.
K. Lumpur, 14th May, 1914.

A. J. McCLOSKY
Senior Medical Officer.
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of March, 1915.

DISTRICT.	Mean Barometrical Pressure at 32o Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Great Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipis	..	..	83.3	92.6	72.1	20.5	75.7	..	..	..	..	3.95	1.50
„ Raub ..	..	..	82.9	92.3	71.6	20.7	75.3	..	..	..	..	3.09	.60
„ Bentong ..	..	..	81.4	90.4	71.3	19.1	75.7	..	..	..	..	6.71	2.55
„ Pekan ..	..	..	82.3	88.2	72.2	16.0	77.6	..	..	..	..	3.25	.98
„ Kuantan ..	..	..	82.7	90.0	74.4	15.6	76.5	..	..	..	..	5.11	2.30
Dispensary Temerloh ..	..	..	..	93.1	70.5	22.6	..	..	..	..	..	4.12	1.27
Kuala Tembeling	..	..	..	..	..	..	..	..	..	..	..	4.48	1.25
Sungei Lembing	..	..	..	91.1	71.2	19.9	..	..	..	..	..	7.53	2.20

Office of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.
K. Lumpur, 14th May, 1914.

A. J. McCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipis ..	..	..	82.8	91.9	73.1	18.8	76.3	..	..	..	..	6.31	1.50
„ Raub	..	..	81.9	90.1	71.0	19.1	75.9	..	..	..	..	3.71	0.56
„ Bentong ..	..	..	81.9	92.0	71.6	20.4	76.0	..	..	..	..	5.47	0.80
„ Pekan ..	..	..	82.7	88.8	72.8	16.0	78.3	..	..	..	..	5.81	1.08
„ Kuantan ..	..	..	82.1	90.2	74.4	15.8	77.3	..	..	..	..	4.85	.93
Sungei Lembing	..	..	..	91.3	72.2	19.1	..	..	..	..	..	9.02	3.03
Kuala Tembeling	..	..	..	..	..	..	..	..	..	..	..	8.70	1.90
Dispensary Temerloh ..	..	..	..	91.4	70.8	20.6	..	..	..	..	..	8.74	1.74

Office of the Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.
K. Lumpur, 16th March, 1915.

A. J. McCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Kelantan for the month of January, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kota Bhar ...	...	144.	79.2	86.40	73.03	13.38	75.9	.829	73.6	83%	...	8.42	1 49
Tumpat ...	...	152.	81.7	83.77	76.09	7.71	77.0	.834	73.8	76%	...	8.37	2.04
Kuala Lebir ...	..	...	77.5	84.7	72.8	11.9	75.2	.829	73.6	87.9%	...	11.14	3.25
Kuala Pahi ...	...	...	...	81.67	71.41	10.26	...	...	...	...	...	12 65	3.78
Kuala Nal ...	...	...	...	83.4	71.3	12.1	...	...	...	...	...	11.66	4.10
Chaning ...	...	...	...	85.81	72.39	13.42	...	..	...	...	...	12.61	3.82
Pasir Jinggi ...	...	...	...	...	...	...	...	...	...	...	...	8.55	2.21
Cherang Tuli ...	...	...	...	...	...	...	...	...	...	...	...	9.06	1.93
Kuala Krai ...	...	...	...	..	...	...	...	...	...	...	...	12.71	2.15
Dominion ...	...	...	...	...	...	...	...	...	...	..	...	12.79	5.85
Taku ...	...	...	...	...	..	...	...	...	...	...	...	11.00	3.34
Sokor (Kenneth) ...	...	...	...	..	...	...	...	...	...	...	...	12.61	4.78
Pasir Besar ...	...	...	...	...	...	...	...	...	...	...	...	15.22	4.12
Lower Sokor ...	...	...	...	.	...	...	...	...	...	...	...	142 8	4.78

Office of the Residency Surgeon
15th February 1915.

L. H. TAYLOR.
Ag : Residency Surgeon Kelantan

Abstract of Meteorological Readings in the various Districts of the State of Kelantan for the month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kota Bharu ...	...	148	80.1	88.96	70.25	18.71	75.3	.788	72.1	.76	....	1.99	.97
Tumpat ...	...	155	81.9	85.39	74 39	11.00	76.6	.812	73.0	.74%	...	1.65	.90
Kuala Lebir ...	...	...	78.0	90.05	70.08	19.25	74.6	.793	72.3	.82%	...	.16	.10
Taku ...	...	...	...	...	...	...	...	...	...	...	...	.32	.16
Kuala Pahi ...	...	..	...	86.89	69.92	16 97	...	...	...	...	...	.33	.19
Kuala Nal ...	...	...	...	89.03	70.00	19.03	...	...	...	...	...	.27	.18
Chaning Estate ...	...	...	...	90.91	69.98	20.93	...	...	...	...	...	.54	.24
Dominion R. Co. ...	...	...	...	...	..	...	...	...	...	...	...	.07	.07
Kuala Krai ...	...	...	...	...	...	...	...	...	...	...	...	.29	.17
Pasir Jinggi ...	...	...	...	...	...	...	...	...	...	...	...	.04	.04
Pasir Gajah ...	...	...	...	...	...	..	..	..	..	...	...	.43	.30
Sokor (Kenneth) ...	...	...	...	...	...	...	...	...	...	...	...	.40	.23
Pasir Besar ...	...	...	...	...	...	...	...	...	...	...	...	.25	.11

Office of the Residency Surgeon,
15th March, 1915.

L. H. TAYLOR,
Ag. Residency Surgeon, Kelantan.

Abstract of Meteorological Readings in the various Districts of the State of Kelantan for the month of March, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kota Bharu ...	...	144.	82.9	91.51	73.41	18.10	77.7	.846	74.2	75%	...	1.03	.42
Tumpat ...	...	153.	83 8	87.51	77 00	10.51	78.9	.900	76.1	77%	...	1.10	.56
Kuala Lebir ...	...	..	82.0	92.9	74 1	18.8	77.8	.868	75.0	79.4%	...	2.02	.53
Kuala Nal ...	...	...	...	93.4	73 3	20.1	...	...	...	...	...	1.98	.60
Kuala Pahi ...	...	..	...	89.55	73.67	15.88	...	...	...	...	...	1.70	.36
Chaning Estate ...	...	...	...	94.00	73.71	20.29	...	...	...	...	..	3.07	1.58
Pasir Jinggi ...	...	...	...	.	...	...	...	...	...	..	...	2.37	.69
Kuala Krai ...	...	...	...	...	...	...	...	...	..	...	...	3.15	.92
Dominion R. Co. ...	...	...	...	...	...	...	.	...	...	...	...	5.39	1.25
Pasir Gajah ...	...	...	...	...	...	...	...	...	...	...	...	3.79	1.10
Taku ...	...	...	...	...	.	...	...	...	...	...	...	2.98	.60
Sokor (Kenneth) ...	...	...	...	..	...	...	...	...	...	...	...	1.95	1.95
Pasir Besar ...	...	...	...	...	...	...	..	...	...	...	...	4.33	1.87

Office of the Residency Surgeon,
13th April, 1915.

L. H. TAYLOR,
Ag. Residency Surgeon, Kelantan.

Abstract of Meteorological Readings in the various Districts of the State of Kelantan for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kota Bharu	..	131.8	84.3	92.7	74.7	18.0	79.2	.891	75.8	75. %	..	4.88	1.50
Tumpat	..	154.	84.5	88.53	77.26	10.76	79.1	.883	75.5	74. %	..	7.95	2.70
Kuala Lebir	..	..	82.2	93.1	75.3	17.8	78.4	.894	75.9	81.3%	..	6.11	1.03
Kuala Nal	..	..	..	93.3	74.3	19.0	..	..	..	..	..	3.69	1.30
Kuala Pahi	..	..	..	89.53	74.03	15.50	..	..	..	..	..	4.08	.81
Chaning	..	..	..	93.63	74.62	19.01	..	..	..	..	..	4.64	1.40
Pasir Jinggi	..	..	..	..	..	..	..	..	..	..	..	5.00	.94
Dominion	..	..	..	..	..	..	..	..	..	..	..	9.95	3.50
Kuala Krai..	..	..	..	..	..	..	..	..	..	..	..	4.16	1.08
Taku	..	..	..	..	..	..	..	..	..	..	..	3.93	1.53
Sokor	..	..	..	..	..	..	..	..	..	..	..	8.76	1.88
Kerilla	..	..	..	..	..	..	..	..	..	..	..	10.03	2.25
Pasir Gajah	..	..	..	..	..	..	..	..	..	..	..	7.93	1.65

Office of the Residency Surgeon,
18th May, 1915.

L. H TAYLOR,
Ag. Residency Surgeon, Kelantan.

Abstract of Meteorological Readings In Malacca for the month of January, 1915.

DISTRICT.	Mean Barametrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Dann. ...	29.801	147.6	81.8	87.4	69.7	17.6	78.7	.941	—	87	N	5.35	2.17 on 18th.

14th February 1915.

A. H. Wheatley.

Abstract of Meteorological Readings in Malacca for the month of February, 1915.

DISTRICT	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature				Hygrometer				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun	29.802	159.5	83.	90.1	71.	19.1	79.	.933	...	83	...	1.87	.38 on 5th

9th March, 1915.

A. H. WHEATLEY.

Abstract of Meteorological Readings in Malacca for the month of March, 1915.

DISTRICT	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature				Hygrometer				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
Durian Daun	29.815	160.2	83.9	90.6	72.7	17.9	79.8	.960	...	83	N.	...	...

10th April, 1915.

A. H. WHEATLEY.

Abstract of Meteorological Readings in Malacca for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun	29.811	156.6	82.6	89.1	72.2	16.9	79.6	.967	—	87	N	12.51	2.46 on 24th.

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12th May 15.

A. H. WHEATLE'.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of January, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hos., Kuala Lumpur		148.2	80.2	87 6	77.7	8.9	76.9	.859	74.6	83	S.E.	5.24	1.24
Prisons ,,		...	...	...	...	...	...	...	...	...	...	7.57	2.22
District Hospital, ,,		...	...	...	...	...	...	...	...	...	...	4.13	1.90
,, ,, Klang		...	80.3	87.1	73.0	14.1	79.2	...	...	...	...	6.92	2.09
,, ,, Kuala Langat		...	...	87.6	73.2	14.4	...	...	...	...	...	8.77	2.75
,, ,, Kajang		...	...	85.1	74.5	10.6	...	...	...	...	...	3.50	1.35
,, ,, K. Selangor		...	...	87.6	75.6	12.0	...	...	...	...	...	6.50	0.97
,, ,, Kuala Kubu		...	...	90.0	70.3	19.7	...	...	...	...	...	3.65	1.18
,, ,, Serendah		...	...	89.7	70.5	19.2	...	...	...	...	...	.77	0.72
,, ,, Rawang		...	...	91.8	71.3	20.5	...	...	...	...	...	1.09	0.35
Sabak Bernam		...	...	...	...	...	...	...	...	...	...	8.22	2.25

Office of the Senior Medical Officer
K. Lumpur, 19th February, 1915.

SD. A. J. McCLOSKY.
Senior Medical Officer
Selangor Negri Sembilan & Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital Kuala Lumpur	29.763	153.0	81.6	88.2	77.1	11.1	77.3	.855	74.4	79.	Calm	3 42	1.31
Prisons ,, ...	...	...	...	...	...	...	...	...	...	...	...	4.99	1.60
District Hospital ,, ...	...	...	....	....	....	....	....	...	...	...	...	5.59	1.50
,, Klang ...	...	..	81 3	89.7	73.6	16.1	76.7	...	...	...	...	1 69	0.59
,, Kuala Langat	...	...	...	89.6	74 3	15.3	...	...	...	...	...	1.63	0.65
,, Kajang ...	...	..	...	87.5	75.0	12.5	...	...	...	...	...	5.43	2.61
,, Kuala Selangor	...	....	...	90.2	76.0	14.2	...	...	...	...	...	0.83	0.83
,, Kuala Kubu ..	...	...	...	92.2	69.9	22.3	...	...	...	...	...	3 09	2.00
,, Serendah ...	...	...	...	92.4	71.0	21.4	...	...	...	...	...	4 36	1.82
,, Rawang ...	...	...	...	94.3	71.6	22.7	..	...	...	...	...	4.29	1.91
Sabak Bernam ...	...	...	...	...	...	...	...	...	...	..	...	1 55	0,85

Office of the Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.
K. Lumpur, 16th March, 1915.

A. J. McCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of March, 1915.

DISTRICT	Mean Barometrical Pressure at 32 Fah.	Maximum in Sun.	Temperature				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.844	145.6	81.3	88.2	77.2	11.0	7.3	.857	74.5	78	S. E.	9.78	1.55
Prisons ,, ...	...	...	...	...	...	..	...	...	...	...	...	7.67	1.55
District Hospital ,, ...	...	...	..	...	...	...	...	...	...	...	...	7.50	1.12
,, Klang ...	...	...	84.1	89.3	74.1	15.2	77.2	...	...	...	...	9.35	3.41
,, Kuala Langat	...	...	...	90.5	75.5	15.0	...	...	...	...	...	3.17	.87
,, Kajang ...	...	...	...	88.4	75.7	12.7	...	...	...	...	...	4.01	1.28
,, Kuala Kubu ...	...	...	...	92.6	72.0	20.6	...	...	...	...	...	6.46	1.24
,, Serendah ...	...	...	...	91.8	71.9	19.9	...	...	...	...	...	7.78	1.43
,, Rawang ...	...	...	...	93.9	72.4	21.5	...	...	...	...	...	5.81	1.80
,, Kuala Selangor	...	...	...	90.6	76.4	14.2	...	...	...	...	...	3.11	.85
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	6.54	1.90

Offic of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.
K. Lumpur, 14th April 1915.

A. J. McCLOSKY,
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32o Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Great Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.320	144.8	81.1	90.5	76.8	13.7	78.2	.914	76.0	84	N.W.	9.02	1.75
Prisons „ ..	..	..	..	..	..	..	..	..	..	..	..	10.35	2.95
District Hospital „ ..	..	..	..	..	..	..	..	..	..	..	..	8.53	1.38
„ Klang ..	..	..	81.5	86.2	75.4	10.8	77.6	..	..	..	..	9.71	1.85
„ K. Langat ..	..	..	..	89.4	75.1	14.3	..	..	..	..	..	8.58	1.34
„ Kajang ..	..	..	..	86.9	75.8	11.1	..	..	..	..	..	8.90	1.50
„ K. Selangor ..	..	..	..	90.1	75.5	14.6	..	..	..	..	..	6.00	1.60
„ Kuala Kubu ..	..	..	..	91.5	74.2	17.3	..	..	..	..	..	8.50	1.26
„ Serendah ..	..	..	..	91.5	72.4	19.1	..	..	..	..	..	9.98	2.40
„ Rawang ..	..	..	..	92.2	72.2	20.0	..	..	..	..	..	5.65	1.00
Sabak Bernam	..	..	..	..	..	..	..	..	..	..	..	**7.76**	**1.80**

Office of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.
K. Lumpur, 14th May, 1914.

A. J. McCLOSKY.
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Abstract of Meteorological Readings In District Hospital Penang for the month of January, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Penang	29.889	143.3	83.0	90.1	73.1	—	76.9	838	74 1	75	—	2.70"	1.25"

District Hospital Penang
14th February, 1915.

V. B. KYLE.
Medical Office District Hospital.
Penang.

Abstract of Meteorological Readings in District Hospital, Penang, for the Month of February, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Penang	29.841	147.2	85.1	93.0	73.1	—	77.2	.832	71.6	69	—	.01"	.01"

District Hospital, Penang,
19th March, 1915

J. LOUDON,
Medical Officer, District Hospl: Penang

Abstract of Meteorological Readings in District Hospital, Penang, for the Month of March, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall During 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Penang	29.879	143.9	84.8	92.7	74.4	—	78.1	.879	74.1	75	—	5.90"	1.43"

District Hospital, Penang,
15th April, 1915

J. LOUDON,
Medical Officer, District Hospl: Penang.

Abstract of Meteorological Readings in District Hospital Penang for the month of April, 1915.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Penang.	29.830	144.1	84.5	91.2	74.2	—	78.9	.906	75.4	78	—	4.97 in.	1.38 in.

District Hospital,
Penang, 14th May, 1915.

G. WHERERTER,
Medical Officer, District Hospital, Penang.

Meteorological Observations taken at Kandang Kerbau During January, 1915.

Latitude 1° 17N Longitude 103° 51E. Height above Mean Sea Level of Barometer Cistern 10 ft 10 ins.
Gravity correction .078 ins. Standard of Time 105 E.L. Height above Mean Sea Level of Rain Gauge 7.67 ins.

Height above Ground of Thermometer 5 feet 4 inches.
Height above Ground of Rim of Rain Gauge 1 ft 5 inches.

Date	Barometer. Corrected and reduced to 32° at Station level. 9 A.M.	3 P.M.	9 P.M.	Air Temperature. Dry 9 A.M.	Dry 3 P.M.	Dry 9 P.M.	Max	Min	Humidity. Dmpt. of Wet 9 A.M.	3 P.M.	9 P.M.	Vapour Pressure 9 A.M.	3 P.M.	9 P.M.	Per Centage 9 A.M.	3 P.M.	9 P.M.	Wind. Direction and Force 9 A.M.	3 P.M.	9 P.M.
	ins.	ins.	ins.	°	°	°	°	°	°	°	°	ins.	ins.	ins.						
1	29·861	29·762	29·844	83°	90°	81°	91°	74·5	77°	79°	76°	·845	·840	·828	75	60	78	N	NE	calm
2	·884	·779	·858	78°	86°	76°	85°	74	76	76°	75°	·826	·805	·808	86	56	86	N	N	,,
3	·883	·817	·858	74·5	77·5	76°	74·5	72	73·5	75·5	75	·797	·840	·853	80	93	93	NE	calm	,,
4	·881	·807	·893	82·5	79°	77·5	87·5	74·5	78·5	77°	76°	·903	·899	·875	83	91	93	calm	,,	,,
5	·920	·829	·891	81·5	79°	77·5	87°	75°	77·5	77°	76°	·872	·899	·875	83	91	93	,,	N	,,
6	·948	·867	·884	76·5	77°	75°	77°	72	75°	75°	73°	·846	·879	·788	90	93	96	,,	,,	,,
7	·891	·782	·884	81·5	87°	78°	90°	74	75°	80·5	76·5	·776	·804	·875	75	74	92	N	W	,,
8	·875	·772	·851	82·5	80°	77°	84°	73	78°	77°	75·5	·806	·883	·846	81	87	96	N	,,	,,
9	·867	·784	·877	83·5	82°	77°	89·5	73·5	78·5	78°	75°	·889	·903	·839	79	83	91	NE	,,	,,
10	·929	·863	·898	82·5	85°	76·5	88·5	75°	78°	76°	75°	·826	·863	·846	81	91	96	calm	,,	,,
11	·944	·805	·907	81°	86·5	79°	88°	73·5	77·5	80°	77°	·878	·934	·899	85	74	91	,,	N	,,
12	·931	·802	·933	83·5	88·5	80°	89°	74°	79°	78°	77°	·928	·815	·885	81	61	87	NE	NE	,,
13	·945	·836	·931	85°	89°	80·5	90·5	73·5	79·5	79°	77·5	·914	·853	·885	77	63	87	,,	,,	,,
14	·953	·881	·907	82	85·5	79·5	87·5	75°	78·5	77·5	76·5	·910	·818	·853	85	68	96	calm	,,	,,
15	·942	·835	·920	83·5	86°	78°	87°	74·5	77°	79°	77·5	·838	·894	·919	73	72	98	NW	W	,,
16	·971	·873	·887	83°	86°	79·5	88·5	75°	78°	79·5	76·5	·889	·901	·855	79	74	86	N	NE	,,
17	30·013	·883	·990	77·5	77·5	78°	87·5	73·5	75·5	75°	76°	·839	·833	·869	91	88	91	calm	calm	,,
18	29·982	·887	·950	81°	79°	78°	83·5	73°	77·5	76·5	76°	·878	·902	·880	87	85	91	N	,,	,,
19	·966	·874	·929	76·5	81·5	77·5	89·5	74°	74°	78·5	75·5	·904	·825	·839	85	78	91	,,	NW	,,
20	·910	·803	·898	78·5	83°	76°	87°	73·5	76°	78·5	73·5	·862	·896	·776	89	81	88	NW	,,	,,
21	·901	·803	·892	82·5	82°	78°	82·5	74°	78°	78°	77°	·896	·903	·912	81	83	95	,,	,,	,,
22	·907	·824	·914	79·5	84°	78·5	87·5	73°	77°	79°	75·5	·892	·921	·826	89	79	96	calm	,,	,,
23	·937	·818	·921	81·5	86°	79°	90·5	72·5	77°	77°	76°	·878	·885	·855	85	87	96	N	N	,,
24	·917	·857	·908	74°	79·5	75·5	90°	70°	75·5	75·5	73°	·819	·812	·776	84	52	88	calm	NE	N
25	·915	·848	·907	74°	76°	74°	79°	70·5	72·5	73°	72°	·765	·770	·756	93	86	96	,,	N	calm
26	·901	·816	·887	80°	86°	79°	88°	73·5	76·5	79°	75°	·882	·804	·812	98	72	92	NW	W	,,
27	·901	·768	·842	83°	88·5	80·5	90°	74·5	75·5	79°	77·5	·768	·866	·878	69	64	85	NE	SW	,,
28	·861	·763	·841	85·5	79°	78·5	87°	75°	79°	77°	77·5	·882	·887	·912	98	91	96	,,	NE	,,
29	·886	·816	·884	85·5	78°	76·5	87·5	75°	78°	76°	755	·856	·906	·853	70	91	96	calm	calm	,,
30	·898	·782	·868	81·5	88°	84°	90·5	76°	78°	78·5	77°	·910	·828	·831	85	64	71	,,	NE	,,
31	·925	·833	·902	83°	87°	78·5	89°	76·5	77·5	77°	75·5	·851	·790	·826	77	62	86	N	E	,,
Means	29·917	29·816	29·893	80·6	83·1	78·1	86·4	73·9	76·0	77·4	75·7	·867	·865	·856	83	79	89	...	...	...

Date	Cloud. Amount. 9 A.M.	3 P.M.	9 P.M.	Cloud. Form. 9 A.M.	3 P.M.	9 P.M.	Weather. At time of observation. 9 A.M.	3 P.M.	9 P.M.	Weather. During interval since. 9 A.M.	3 P.M.	9 P.M.	Rain. Amount entered to day preceding that of measurement.	Estimated duration.	Radiation. Min. on Grass	Max in Sun which Bulb is Blackened
													ins.		°	°
1	4	7	8	Cir	C. Cum Str	Str	bc	c	c	c	c	c	...	...	71·5	159°
2	9	8	10	Str	Str	...	c	c	c	R	R	R	·86	9	73°	150°
3	10	10	8	N	N	Cir Str	R	c	c	R	c	c	1·8	4½	71·5	88·5
4	7	10	4	C. Cum Str	N	Cir	c	R	bc	R	R	c	·56	2½	73·5	163·5
5	6	10	6	Cir Str	N	Cir Cum	c	d	c	R	d	R	·45	1¼	73°	149°
6	10	10	4	N	Cum Str	Cir	d	d	bc	d	d	bc	·14	2½	69°	88·5
7	3	9	8	Cir	C. Cum Str	Cir Str	c	c	c	R	c	c	·75	3½	71·5	154
8	8	10	4	Cir Str	N	Cir	c	d	bc	R	R	bc	·28	2½	70·5	164
9	4	9	2	Cir	Cir Str	,,	bc	c	bc	R	R	bc	·66	2¾	72°	159·5
10	5	10	8	Cir Str	Cir Str	Cir Str	d	d	c	R	R	R	·35	½	74°	148·5
11	8	8	0	Cir Str	C. Cum Str	b	c	c	b	c	bc	c	...	...	71·5	166
12	6	6	0	C. Cum Str	,,	b	c	c	b	c	bc	bc	...	...	71·5	161
13	3	6	0	Cir	,,	b	bc	c	b	bc	bc	bc	...	...	72°	160
14	8	7	0	C. Cum Str	,,	b	c	c	b	R	bc	bc	·20	8	72·5	155·5
15	8	8	3	,,	,,	Cir	c	c	bc	R	R	bc	·29	1½	70·5	154·5
16	5	8	2	,,	,,	,,	c	c	bc	c	c	d	·06	2	74°	156°
17	9	10	4	Str	Cum Str	,,	c	o	bc	d	d	c	·11	2	71°	166°
18	7	10	6	C. Cum Str	N	Cir Str	c	d	c	R	d	c	·70	6	72°	149
19	9	9	8	Str	Str	,,	c	c	c	d	c	d	·04	1½	72·5	163
20	9	8	7	,,	C. Cum Str	,,	c	c	c	R	d	c	·07	¾	70°	143
21	7	8	8	C. Cum Str	,,	Str	c	c	c	RLt	c	c	1·33	1½	73°	155·5
22	9	7	4	Cir Str	,,	Cir	c	c	bc	R	c	bc	·09	¾	69·5	129·5
23	3	3	2	Cir	Cir Cum	,,	bc	bc	bc	bc	bc	dc	...	...	70°	157·5
24	8	10	9	Cir Str	Cir Str	Cu Str	c	d	c	d	d	R	·41	4½	71°	118°
25	10	10	7	N	N	,,	d	d	c	d	d	c	·23	1½	67°	131°
26	3	5	2	Cir	C. Cum Str	Cir	bc	bc	bc	bc	d	bc	...	...	70°	155·5
27	5	5	4	C. Cum Str	,,	,,	bc	bc	bc	bc	bc	bc	...	...	72·5	156
28	5	10	10	,,	N	N	c	d	d	RLt	d	R	·70	¼	71·5	151·5
29	8	10	9	,,	N	Str	c	d	c	R	d	d	·07	¼	74	148·5
30	8	7	4	Cir Str	C. Cum Str	Cir	c	c	bc	b	bc	bc	...	...	73	163·5
31	6	8	10	,,	,,	Str	c	c	c	c	c	b	·01	½	72	160
													Total ... 9·27			
Means	6	8	5	...	...	...	...	...	...	...	...	...	28 Days	...	71·7	148·7

SUMMARIES:

Weather—No. of days of

Rain, Thunderstorm.	Clear Sky,	Overcast.	Fog.	Gales
23	5	3		

Wind—No. of observations of

Forces, 1—7.	Calm	N,	NE,	E,	SE.	S,	SW,	W,	NW.
	51	13	15	1	—	—	1	4	8

EXTREMES:

Highest corrected Reading of Barometer	.. 30.013 on 17th.	Lowest Temperature in Shade	... 72.0 on 3rd
Lowest ,, ,, ,,	... 29.762 on 1st.	Hight ,, in Sun ...	... 166.0 on 11th.
Greatest Daily Rainfall	... 1.33 on 21st.	Lowest ,, on Grass ...	... 67. on 12th.
Highest Temperature in Shade	... 91.0 on 1st.	No. of Days of Temperature on Grass below 70° ... 3.	

W. Gilmore Ellis,
Municipal Civil Medical Officer, S.S.

Meteorological Observations taken at Kandang Kerbau, During February, 1915.

Latitude 1° 17N. Longitude 103° 51E. Height above Mean Sea Level of Barometer Cistern 10 feet 10 inches.
Gravity correction 078 inch. Standard of Time 105E.L. Height above Mean Sea Level of Rain Gauge 7.87 inches.

Date	Barometer. Corrected and reduced to 32° at Station level. 9. A.M.	3. P.M.	9. P.M.	Air Temperature. Dry. 9 A.M.	9 P.M.	3 P.M.	Max.	Min.	Humidity. Dep. of Wet. 9 A.M.	9 P.M.	3 P.M.	Vapour Pressure Per Cent. 9 A.M.	9 P.M.	3 P.M.	Mean.	Wind Direction and Force. 9 A.M.	3 P.M.	9 P.M.	Cloud. Depth.	Amount. 6 A.M.	12 Noon.	6 P.M.	9 P.M.	Forms. 6 A.M.	12 Noon.	6 P.M.	Weather. Amount of Sunshine recorded.	Evaporation recorded.	Rain. Recorded duration	Hours	Inches.
	ins.	ins.	ins.																												
1	29.902	29.813	29.861	81	87	80	90	76	77.5	79.5	77	818	885	853	85	70	81	NE	N	1	8	7	4	Cir Str	C Cum Str	Cir	h	m	hr	m	
2	897	778	833	82.5	88	79.5	91	74	78	79.5	76.5	866	882	862	81	67	80	NE	SE	calm	2	4	2	4	C Cum Str	C Cum Str	Cir	h	m	hr	m	
3	883	772	831	83	89	81.5	90	74	77.5	79.5	77.5	923	890	892	70	68	81	NE	SW	calm	3	2	1		Cir	C Cum Str	Cir	h	m	hr	m	
4	891	765	861	85.5	88	82	90	73.5	79	80	77.5	901	833	863	74	69	81	E	SE	NE	3	3	3	3	Cir	C Cum Str	Cir Str	h	m	hr	m	
5	921	799	871	86	86.5	79	90.5	74	79	79	77.5	876	887	866	72	70	79	calm	E	calm	5	2	8	4	Cir	C Cum Str	Cir Str	h	m	hr	m	
6	917	789	846	85	88	84	90	74	78	80.5	77	870	910	872	72	74	80	calm	NE	calm	6	7	8	6	C Cum Str	C Cum Str	C Cum Str	h	m	hr	m	
7	861	756	837	82.5	90	79	92	74.5	77.5	79	77	838	840	850	76	80	81	NE	NE	..	7	4	2	0	Cir	Cum Str		h	m	hr	m	
8	886	778	869	84	90	82	94.5	72	77	78	76	841	900	850	71	77	79	calm	W	calm	8	7	6	6	Cir	C Cum Str	Cir Str	h	m	hr	m	
9	899	797	855	86	81.5	80	90	74.5	77.5	77.5	76	841	870	852	66	82	82	..	S	..	9	3	7	0	Cir Str	C Cum Str	Str	h	m	hr	m	
10	879	755	815	85	88	79.5	91	74	78	77.5	77.5	862	784	870	72	66	81	..	SE	..	10	2	8	4	Cir	C Cum Str	Cir	h	m	hr	m	
11	871	764	815	82	87	80	89	74	79	80.5	78.5	838	861	837	82	74	80	calm	NE	..	11	7	7	4	Cir Str	C Cum Str	Cir	h	m	hr	m	
12	869	749	815	82	83	80.5	90	73	78.5	80	79	826	910	840	85	68	81	..	..	..	12	7	7	4	Cir Str	C Cum Str	Cir	h	m	hr	m	
13	844	739	785	81.5	89	79	89	69.5	76	77	74.5	841	889	773	77	67	80	NE	..	..	13	7	7	5	Cir Str	Cir Str	Cir	h	m	hr	m	
14	867	768	850	83	87	78.5	89	74	76	78.5	76.5	891	849	870	74	67	80	calm	SE	..	14	8	7	8	Cir	Cir Cum Str	Cum Str	h	m	hr	m	
15	883	823	866	83	80	76	84	72	78.5	77	74.5	890	885	848	81	82	84	NW	calm	..	15	2	8	0	Cir Cum	Cum Str	Cir Str	h	m	hr	m	
16	869	783	857	82	86	79	90.5	75	78	80	77	866	840	869	87	76	91	NE	NW	..	16	8	8	6	Cir	C Cum Str	Cir Str	h	m	hr	m	
17	882	786	845	78.5	78	77	84	72	76.5	76.5	76	887	858	887	84	86	86	calm	calm	..	17	8	8	4	N	Str	Cir	h	m	hr	m	
18	868	793	848	83.5	79	78	89.5	74.5	79.5	77	76	845	869	870	81	81	81	..	SE	..	18	8	10	4	C Cum Str	N	Cir	h	m	hr	m	
19	899	811	857	82	85.5	80	86	72	78	78.5	77	866	885	886	81	72	87	NE	NE	..	19	9	7	3	Cum Str	C Cum Str	Cir	h	m	hr	m	
20	821	826	896	85	81	77	89	74.5	79	78.5	77	888	928	838	70	80	91	NW	calm	NE	20	2	0	0	C Cum Str	Str		h	m	hr	m	
21	941	872	899	81	87	79	88.5	72	76.5	78	76.5	845	889	869	80	86	86	N	N	calm	21	6	8	4	Cir Str	Cir Str	Cir	h	m	hr	m	
22	934	873	911	83.5	85.5	80	90	74.5	77	76.5	75.5	848	869	868	84	83	85	NE	NE	..	22	9	2	0	Cir	Cir Str		h	m	hr	m	
23	922	809	859	84.5	86	79	89	74.5	77.5	77	76.5	841	884	862	74	73	83	SE	..	..	23	9	7	4	Cir	C Cum Str	Cir	h	m	hr	m	
24	887	769	835	83	89	80	91	72	77.5	78	75.5	841	868	868	73	70	83	NE	..	NE	24	4	6	4	C Cum	Cir Str	Cir	h	m	hr	m	
25	913	782	852	83	89	80.5	91	70	76.5	78	77	848	868	876	73	79	76	..	..	calm	25	4	6	1	C Cum Str	C Cum Str	Cir	h	m	hr	m	
26	914	784	874	84	88.5	81	89.5	71	78	79.5	77.5	876	867	866	75	68	81	..	S	..	26	9	7	4	Cir	C Cum Str	Cir	h	m	hr	m	
27	879	772	854	86	89	80.5	90.5	73	79	80	76	891	900	868	72	66	81	..	S	NE	27	3	6	1	Cir	C Cum Str	Cum Str	h	m	hr	m	
28	895	761	856	83.5	91	84	93	71	78	76.5	76	845	867	846	70	86	84	..	S	calm	28	4	4	4	Cir	Cir Cum	Cir	h	m	hr	m	
Means	29.889	29.787	29.850	83.4	86.6	79.7	89.5	72.8	77.7	78.4	76.4	867	871	858	78	75	85				4	6	4									

SUMMARIES:

Weather—No. of days of

Rain	Thunderstorm	Clear Sky	Overcast	Fog	Gales.
15		13			

Wind—No. of Observations of

Forces	1—7.	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.
		82	8	91	2	6	4	1	4	3

EXTREMES:

Highest corrected Reading of Barometer	...	Lowest Temperature in Shade	...
Lowest ...	...	Highest ...	...
Greatest Daily Rainfall	...	Lowest ...	...
Highest Temperature in Shade	...	No. of Days of Temperature	...

Meteorological Observations taken at Kandang Kerbau During March, 1915.

Latitude 1° 17N Longitude 103° 51E. Height above Mean Sea Level of Barometer Cistern 10 ft. 10 ins. Height above Ground of Thermometer 5 feet 4 inches.
Gravity correction 078 inch. Standard of Time 105 E. L. Height above Mean Sea Level of Rain Gauge 7.67 ins. Height above Ground of Rim of Rain Gauge 14.5 inches.

Date	Barometer. Corrected and reduced to 32° at Station level.			Air Temperature.					Humidity.									Wind. Direction and Force.			Date	Cloud.						Weather.						Rain.		Radiation.	
				Dry.	Dry.	Dry.			Dep. of Wet.			Vapour Pressure.			Per Centage.							Amount.			Form.			At time of observation.			During interval since.			Amount entered to day preceding that of measurement.	Estimated duration.	Min. on Grass	Max in Sun, Black Bulb in vacuo.
	9. A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	Max.	Min.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.		9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.				
	ins.	ins.	ins.	°	°	°	°	°	°	°	°	in.	in.	in.																	in.	hrs.	°	°
1	29·887	29·794	29·881	85°	91°	80°	93°	70·5	78°	77·5	75°	·862	743	799	72	52	78	NE	NE	NE	1	3	4	2	Cir Cum	Cir Cum	Cir	bc	bc	bc	bc	bc	bc			67°	157·5
2	·921	·835	·894	85°	91°	81°	92°	71°	77°	76·5	77°	·818	700	872	68	49	83	,,	,,	calm	2	3	3	1	Cir	Cir	Cir	bc	bc	bc	bc	bc	bc			69°	161·5
3	·905	·812	·897	85·5	89·5	80°	90·5	72°	78·5	78°	76°	·862	801	842	72	58	82	N	,,	,,	3	5	7	6	C. C. Str	C. C. Str	Cir Str	c	c	c	c	c	c			70·5	160·5
4	·954	·793	·902	86·5	87·5	81°	90·5	73°	79°	80·5	76·5	·887	927	835	70	72	80	NE	SE	NE	4	5	6	6	C. C. Str	C. C. Str	Cir Str	c	c	c	r	c	c	·11	½	70·5	159°
5	·957	·780	·893	83°	90	82°	90·5	73·5	78·5	80·5	77·5	·896	893	865	81	64	81	,,	,,	,,	5	5	3	4	Cir	Cir Cum	Cir	bc	bc	bc	bc	bc	c			71·5	155°
6	·949	·796	·859	82°	86·5	82 5	90°	74·5	79°	79·5	78°	·948	894	896	87	72	81	SE	,,	,,	6	8	5	2	C. C. Str	C. C. Str	Cir	o	c	bc	d	bc	bc	·01	1/6	71·5	158·5
7	·921	·807	·883	88°	89°	88°	91°	74°	79°	78·5	78·5	·867	815	937	66	61	93	NE	,,	calm	7	2	6	4	Cir	C. C. Str	Cir	bc	c	bc	bc	c	bc			72°	154°
8	·954	·800	·857	87°	89°	83°	91°	74°	80°	80·5	79°	·927	893	935	72	64	83	calm	calm	,,	8	4	5	2	Cir Cum	C. C. Str	Cir	bc	c	bc	d	bc	bc	·03	¼	72°	158·5
9	·948	·826	·939	87·5	88·5	82°	90°	72·5	81°	78°	77°	·968	815	858	74	61	79	,,	SE	,,	9	3	6	4	Cir Cum	C. C. Str	Cir	bc	c	bc	bc	c	c			68·5	154°
10	·939	·808	·894	86·5	88·5	81·5	91°	72·5	78.5	79·5	77°	·849	867	865	68	66	81	NE	,,	,,	10	6	3	2	C. C. Str	Cir Cum	Cir	c	bc	bc	c	bc	bc			68°	156°
11	·936	·792	·889	87°	90°	79°	93°	74°	79·5	80°	77°	·887	886	899	70	63	91	,,	SW	,,	11	3	6	1	Cir	Cir Str	Cir	bc	c	bc	bc	r	bc	·33	½	72°	156·5
12	·935	·773	·876	85°	84·5	81°	89·5	73·5	80°	78°	79°	·954	886	962	79	63	91	,,	NE	,,	12	6	8	2	C. C. Str	C. C. Str	Cir	c	c	bc	c	t	bc			72·5	146·5
13	·926	·788	·857	87·5	87°	80°	89·5	73°	81°	81°	79°	·981	974	975	78	76	95	calm	calm	,,	13	5	4	2	Cir Cum	Cir Cum	Cir	c	bc	bc	r	bc	bc	1·25	1	72°	147°
14	·909	·788	·879	86·5	89·5	82°	90°	76°	81·5	81°	78°	·988	954	903	80	71	83	,,	,,	,,	14	7	4	2	C. C. Star	Cir Cum	Cir	c	bc	bc	c	bc	c			74°	152°
15	·921	·823	·890	86°	79·5	78°	90°	72·5	80°	77·5	76°	·940	899	869	76	91	91	,,	,,	,,	15	8	9	6	C. C. Star	Cum Str	Cir Str	c	d	c	rt	d	c	1·19	1¾	71·5	160·5
16	·937	·801	·866	85°	86°	78°	91·5	72·5	79·5	80°	76·5	·914	940	875	77	76	93	,,	S	,,	16	4	8	2	C. Cum	C. C. Str	Cir	bc	o	bc	c	r	bc	·10	1	71·5	160°
17	·933	·812	·874	85°	90°	81·5	93°	72·5	78°	81°	77·5	·862	934	872	72	66	83	,,	SW	,,	17	3	6	4	Cir Cum	C. C. Str	Cir	bc	c	bc	bc	c	bc			70·5	160·5
18	·963	·861	·909	85°	88·5	80°	92°	74°	78°	77·5	75°	·862	912	799	72	95	78	NE	E	,,	18	2	4	2	Cir	Cir Str	Cir	bc	bc	bc	bc	bc	bc			72°	156°
19	·971	·854	·940	88°	89°	81°	91°	74·5	80°	78°	76°	·913	808	828	69	59	78	,,	NE	,,	19	5	6	6	Cir Cum	C. C. Str	C. C. Str	bc	c	c	c	rlt	rt	·47	1½	73.5	155°
20	·985	·776	·884	77·5	89°	81°	89°	74°	75°	80·5	77·5	·833	906	878	88	67	85	S	SE	,,	20	9	5	2	Cum Str	C. C. Str	Cir	d	c	bc	d	bc	bc	·03	½	73°	149°
21	·907	·796	·849	86°	87°	80°	91°	74°	79°	80°	77·5	·894	927	892	72	72	89	NE	calm	,,	21	4	8	0	Cir Cum	C. C. Str	b	bc	c	o	c	d	bc	·03	½	73°	160°
22	·876	·767	·837	87°	86°	79·5	89°	74°	81°	81°	78°	·974	988	937	76	80	93	,,	NE	,,	22	4	7	2	Cir Cum	C. C. Str	Cir	bc	c	bc	t	tr	bc	·24	1½	73°	154°
23	·889	·818	·893	86°	89	82·5	90°	74·5	81°	78·5	79°	·988	815	942	80	61	85	calm	E	,,	23	7	5	2	C. C. Str	C. C. Str	Cir	c	bc	bc	c	bc	bc			73·5	150°
24	·930	·810	·889	87·5	89°	83°	91°	74·5	80·5	80·5	79°	·927	906	935	72	67	83	E	SE	,,	24	5	8	5	C. C. Str	C. C. Str	Cir Cum	bc	c	c	c	c	rlt	·39	1	73·5	155·5
25	·918	·810	·882	87°	88·5	81°	90°	74°	81°	81.	77·5	·974	954	878	76	71	85	,,	,,	,,	25	6	7	0	C. C. Str	C. C. Str	b	c	c	b	c	bc	bc			73.5	150°
26	·921	·768	·799	85°	87°	82°	90°	76°	81°	78°	78·5	1·001	835	910	83	65	85	calm	NE	,,	26	4	5	6	Cir	C. C. Str	Cir Str	bc	c	c	bc	c	c			75·5	152°
27	·905	·764	·868	82·5	89°	81°	90°	75°	79·5	78°	78·5	·948	808	923	87	59	89	,,	,,	,,	27	4	5	3	Cir	C. Cum	Cir	bc	bc	bc	bc	bc	bc			74°	160°
28	·927	·886	·892	85·5	82·5	81·5	89°	75·5	79°	79°	79·5	·901	942	962	74	85	91	,,	calm	S	28	6	8	6	C. C. Str	Str	C. C. Str	c	c	lt	c	d	lt	·01	1/6	74·5	150°
29	·897	·816	·884	85°	86°	81.5	88°	76°	81°	79°	78·5	1·001	894	916	83	72	87	SE	,,	S	29	4	8	4	Cir Cum	C. C. Str	Cir Cum	bc	c	bc	d	c	rl	·14	5/6	75°	149°
30	·921	·823	·888	86°	85°	81.	88°	74°	81°	79°	79°	·988	908	962	80	76	91	calm	SE	calm	30	5	7	6	C. C. Str	Str	Cir Cum	bc	c	c	dt	c	bc	·01	1/6	73°	155.
31	·912	·788	·862	87°	90.5	81·5	90·5	74·5	80°	80·5	78·5	·927	886	916	72	63	87	SE	,,	,,	31	3	3	4	C. Cum	C. Cum	Cir	bc	bc	bc	bc	bc	bc			73·5	159°
																																	Total... 4·35			
Means	29·927	29·805	29·880	85·5	87·8	81·1	90·4	72·7	79·5	79·2	77·6	·920	880	894	75	68	85	...	...	...	Means	4	5	3	...	...	...	...	...	...	...	...	...	15 Days	...	75·3	155·2

SUMMARIES:

Weather—No. of days of

Rain,	Thunderstorm,	clear Sky,	Overcast,	Fog,	Gales.
15		14	2		

Wind—No. of observations of

Forces,	4—7,	Calm,	N,	NE,	E,	SE,	S,	SW,	W,	NW.
44	1	24	4	14	4	2				

EXTREMES:

Highest corrected Reading of Barometer	... 29.985 on 20th.	Lowest Temperature in Shade	... 70.5 on 1st.
Lowest ,, ,, ,,	... 29.764 on 27th.	Highest ,, in Sun	... 161.5 on 2nd.
Greatest Daily Rainfall ...	... 1.25 on 13th.	Lowest ,, on Grass	... 67.0 on 1st.
Highest Temperature in Shade	... 93.0 on 1st, 11th & 17th.	No. of Days of Temperature on Grass below 70° 4 days.	

W. Gilmore Ellis,
Municipal Civil Medical Officer, S.S.

Meteorological Observations taken at Kandang Kerbau During April, 1915.

Latitude 1° 17N Longitude 103° 51E Height above Mean Sea Level of Barometer Cistern 10 feet 10 inches.
Gravity correction 078 inch. Standard of Time 105EL. Height above Mean Sea Level of Rain Gauge 7·67 ins.

Height above Ground of Thermometer 5 feet 4 inches.
Height above Ground of Rim of Rain Gauge 14.5 inches.

Date	Barometer. Corrected and reduced to 32° at Station level.			Air Temperature. Dry.		Dry.			Humidity. Dep. of Wet.			Vapour Pressure.			Per centage.			Wind. Direction and Force.		
	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	Max.	Min.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M	9 P.M.	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.
	ins.	ins.	ins.	°	°	°	°	°	°	°	°	in.	in.	in.						
1	29·888	29.791	29 849	90·	82·	79·	91·	72·	81.5	80·	78·	·940	·995	·943	68	91	95	NE	calm	calm
2	·917	·772	·806	85·	88·	78·	93·	76·	79.	80	70·	·908	·913	·624	76	69	65	N W	,,	,,
3	·893	·812	·836	88·	84·5	81·	88·	73·	81.5	79·5	79·	·968	·921	·962	74	79	91	calm	,,	,,
4	·913	·784	·845	86·	92·	85·	93·	74·	79.5	81·5	79·	·901	·913	·908	74	62	76	SW	,,	,,
5	·891	·778	·845	88·5	87·	83·	92·5	76·	79·	79·	80·5	·860	·880	·988	64	69	89	SE	SE	,,
6	·925	·820	·899	86·5	84·	83·	90·	73·5	79·5	78·	78·	·894	·876	·889	72	75	79	calm	,,	SE
7	·906	·808	·899	87·	87·	82·	90·	74·5	80·	82·	79·5	·927	1·023	·955	72	80	89	,,	calm	calm
8	·872	·772	·839	89·	83·5	82·	92·5	74·5	82·	80·	80·	·996	·974	·995	73	85	91	NE	,,	,,
9	·905	·779	·863	86·5	81·	79·	92·	74·	82·	79·	77·	1·030	·962	·899	82	91	91	calm	,,	,,
10	·879	·753	·821	85·4	88·5	82·	89·5	74·5	81·	80·5	79·	1·001	·913	·948	83	69	87	,,	E	,,
11	·909	·780	·830	86·	85·5	81·	90·5	75·5	80·	79·	77·5	·940	·901	·878	76	74	85	E	SE	SE
12	·862	·730	·799	87·	87·	80·	90·5	74·5	81·	80·5	78·5	·974	·934	·937	76	74	93	SE	S W	calm
13	·900	·770	·795	89·5	89·	82·5	90·	76·	82·	81·	80·	·996	·947	·988	73	69	89	N E	calm	,,
14	·903	·779	·816	82·5	85·5	81·5	82·5	75·	79·	80·	80·	·942	·947	1·002	85	78	93	calm	,,	,,
15	·881	·790	·813	85·5	87·5	82·	89·	75·5	80·5	79·5	79·	·954	·880	·948	79	69	87	,,	SE	,,
16	·875	·720	·835	85·	90·	83·	90·5	75·	80·	81·5	80·5	·954	·940	·988	79	69	89	SE	calm	,,
17	·853	·830	·796	88·	92·	84·	93·	75·	80·5	82·	80·	·920	·955	·968	71	64	83	S	W	,,
18	·833	·825	·854	86·5	92·	84·5	92·5	75·	80·	80·5	79·5	·934	·866	·921	74	59	79	W	SW	,,
19	·819	·770	·803	88·	82·5	79·5	90·	74·5	80·5	79·5	78·	·920	·948	·869	71	87	91	S W	calm	,,
20	·855	·816	·844	85·5	78·	78·	88·	73·	80·	76·5	76·	·947	·875	·869	78	93	91	calm	,,	,,
21	·821	·724	·837	83·5	83·	80·	89·	75·	78·5	80·5	78·	·889	·988	·930	79	89	91	,,	,,	,,
22	·853	·735	·773	83·	84·	80·	90·	75·	78·5	79·	78·	·896	·921	·930	81	79	91	NE	E	,,
23	·818	·722	·832	87·	87·	78·	89·5	74·5	79·	80·5	77·	·880	·934	·912	69	74	95	calm	calm	,,
24	·839	·742	·837	86·	83·	80·	88·	74·5	81·	78·5	78·	·988	·896	·930	80	81	91	,,	,,	,,
25	·848	·735	·788	81·	80·5	87·5	82·	73·	78·5	78·5	78·	·923	·930	·828	89	91	64	,,	,,	,,
26	·816	·709	·781	87·	86·	79·5	90	74·	81·5	79·	77·5	·981	·894	·899	78	72	91	N W	SE	calm
27	·851	·714	·771	80·	81·5	79·5	85·	73·	77·5	79·	77·5	·892	·955	·899	89	89	91	W	calm	,,
28	·847	·726	·797	85·	87·5	82·	95·	75·	79·5	80·	79·5	·914	·920	·955	77	71	89	calm	SE	,,
29	·868	·731	·815	81·5	86·	80·5	89·	74·	79·	79·5	79·	·955	·901	·969	89	74	93	,,	calm	,,
30	·863	·758	·789	79·5	86·5	80·	89·	75·	77·5	79·	77·5	·899	·887	·892	91	70	89	,,	E	,,
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Means																				

Date	Cloud. Amount. 9 A.M.	3 P.M.	9 P.M.	Form. 9 A.M.	3 P.M.	9 P.M.	Weather. At time of observation. 9 A.M.	3 P.M.	9 P.M.	During interval since. 9 A.M.	3 P.M.	9 P.M.	Rain. Amount entered to day preceding that of measurement.	Estimated duration.	Radiation. Min. on Grass	Max in Sun, Black Bulb in vacuo.
													ins.	hrs.	°	°
1	4	8	4	C. Cum	Str	Cir	bc	c	bc	Rlt	c	c	2·75	2¾	71·5	153°
2	6	4	4	C. C. Str	Cir	,,	c	bc	bc	c	bc	c	...	...	75°	163°
3	7	8	3	,,	,,	C. C. Str	c	c	bc	R	c	bc	0·70	1½	71·5	139°
4	3	2	0	C Cum	C. Cum	b	bc	bc	b	bc	bc	bc	...	...	73·5	150°
5	2	6	6	Cir	C. C. Str	Cir Str	bc	c	c	bc	c	dlt	...	...	75°	154°
6	5	7	2	,,	,,	Cir	bc	bc	bc	c	bc	bc	...	...	72·5	154·5
7	5	5	4	C. C. Str	C. Cum	,,	bc	c	bc	c	bc	bc	...	..	73·5	152°
8	5	8	6	,,	C. C. Str	Cir Str	bc	c	c	Rt	c	dlt	·72	5/6	74°	155°
9	6	8	6	,,	,,	,,	c	c	c	Rt	dt	c	·20	1	73·5	158°
10	5	6	4	,,	,,	Cir	c	c	bc	c	c	bc	...	...	73°	157°
11	5	8	8	,,	,,	C. C. Str	bc	c	c	c	dlt	dlt	·05	3/6	75°	149·5
12	5	6	4	,,	,,	Cir	bc	c	bc	c	dlt	c	·16	5/6	73°	157·5
13	6	7	6	,,	,,	Str	c	c	c	Rlt	c	dt	·49	1	75·5	152°
14	6	8	4	,,	Str	Cir	c	c	bc	c	c	bc	...	...	74°	131°
15	5	6	4	C. Cum	C. C. Str	,,	c	c	bc	c	c	d	·02	¼	74·5	153·5
16	7	4	2	C. C. Str	C. Cum	,,	c	bc	bc	c	bc	Rt	...	...	74°	154·5
17	6	8	4	,,	C. C. Str	Cir Str	c	c	bc	c	c	bc	·78	1	74·5	154°
18	4	2	0	C. Cum	C. Cum	b	bc	bc	bc	bc	bc	bc	...	...	74·5	150°
19	3	10	7	Cir	Str	Str	bc	c	c	Rlt	c	c	·32	1	73·5	152°
20	6	10	4	C. C. Str	N	Cir	c	d	bc	Rlt	d	c	·49	2	72·5	148°
21	7	9	8	,,	C. Str	Cir Str	c	d	d	d	d	d	·17	5½	74°	150·5
22	8	8	8	,,	C. C. Str	,,	c	c	c	R	d	d	·43	2	74°	148°
23	4	8	4	Cir	,,	Cir	bc	c	bc	c	Rlt	bc	1·00	1½	73·5	150·5
24	5	9	8	C. Cum	,,	Cir Str	c	o	c	c	c	d	·02	¾	74°	144°
25	9	9	7	C. C. Str	Str	,,	d	o	c	R	c	bc	·63	3	72°	126°
26	2	9	8	Cir	C. C. Str	C. C. Str	bc	o	c	T	c	c	...	...	73°	151°
27	10	8	4	C. C. Str	Str	Cir Str	o	c	bc	d	c	c	·12	1	72°	137°
28	7	7	4	C. Cum	C. C. Str	Cir	c	c	bc	c	c	c	...	...	73·5	151·5
29	8	9	6	C. C. Str	Str	Cir Str	c	o	c	c	c	d	...	...	73°	155°
30	10	8	2	N	C. C. Str	Cir	d	o	Bc	dt	c	bc	·02	¾	74°	55·5
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

SUMMARIES:

Weather—No. of days of

Rain,	Thunderstorm,	Clear Sky,	Overcast,	Fog,	Gales.
18	7	5	—	—	

Wind—No. of Observations of

Forces,	4—7,	Calm	N,	NE,	E,	SE,	S,	SW,	W,	NW.
61	—	4	4	11	1	4	3	2		

EXTREMES:

Highest corrected Reading of Barometer ... 29.925 on 6th.
Lowest ,, ,, ,, ... 29.771 on 27th.
Greatest Daily Rainfall ... ... 2.75 on 1st.
Highest Temperature in Shade ... 93.0 on 2nd, 4th, 17th.
Lowest Temperature in Shade ... 72.0 on 1st.
Highest ,, in Sun ... 163.0 on 2nd.
Lowest ,, on Grass ... 71.5 on 1st. & 3rd
No. of Days of Temperature on Grass below 70° Nil.

W. Gilmore Ellis,
Municipal Civil Medical Officer, S.S.